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December 1961

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Serck Tubes are in use in the new crude oil distillation unit at Shell Haven Refinery

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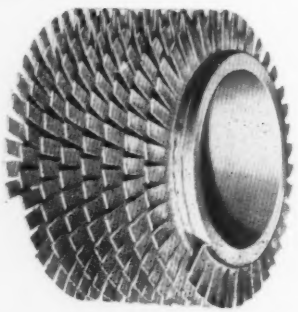

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REVIEW

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Contents

THE DEVELOPMENT OF THE SOUTH-EAST KUWAIT OILFIELDS. *By* A. F. FOX 373
AROUND THE BRANCHES 379
LADIES NIGHT AT THE INSTITUTE 382
I.P.C. NEGOTIATIONS WITH THE IRAQ GOVERNMENT ... 383
THE GROUND STORAGE OF LIQUEFIED GASES 384
NEW LIQUID–SOLID FUEL DEPOT 386
NOTES OF THE MONTH 387
BRANCH OF THE MONTH—THE ESSEX BRANCH ... 392
PERSONAL NOTES 396
LECTURES, COURSES, AND CONFERENCES 398
A RECORD ATTENDANCE AT THIS YEAR'S CBMPE DINNER 399
BOOKS AND FILMS 400
BULK OIL QUANTITIES, WEIGHTS IN AIR AND IN VACUO 400
EQUIPMENT DEVELOPMENTS 402
TRADE NEWS 402
FORTHCOMING MEETINGS 405

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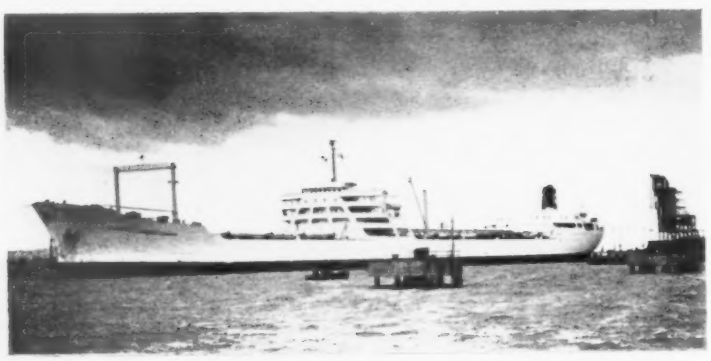

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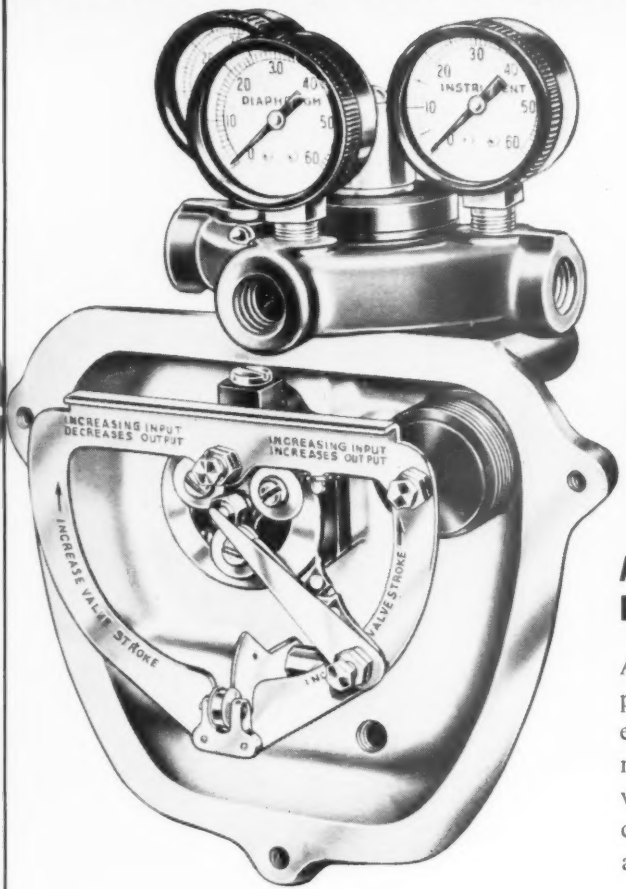

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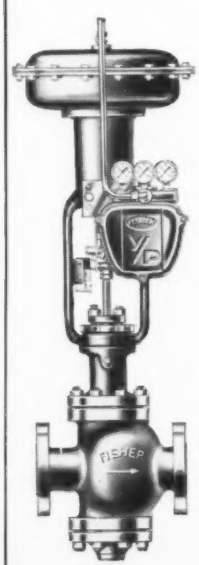

Hysteresis (Average)	0.0012 in
Linearity (with linear cam)	within ± 1%
Open loop Gain (with linear cam)	86
Resolution Sensitivity	0.002 lb/in²
Repeatability	±0.0003 in
Stroking Speed	0.4 in/s
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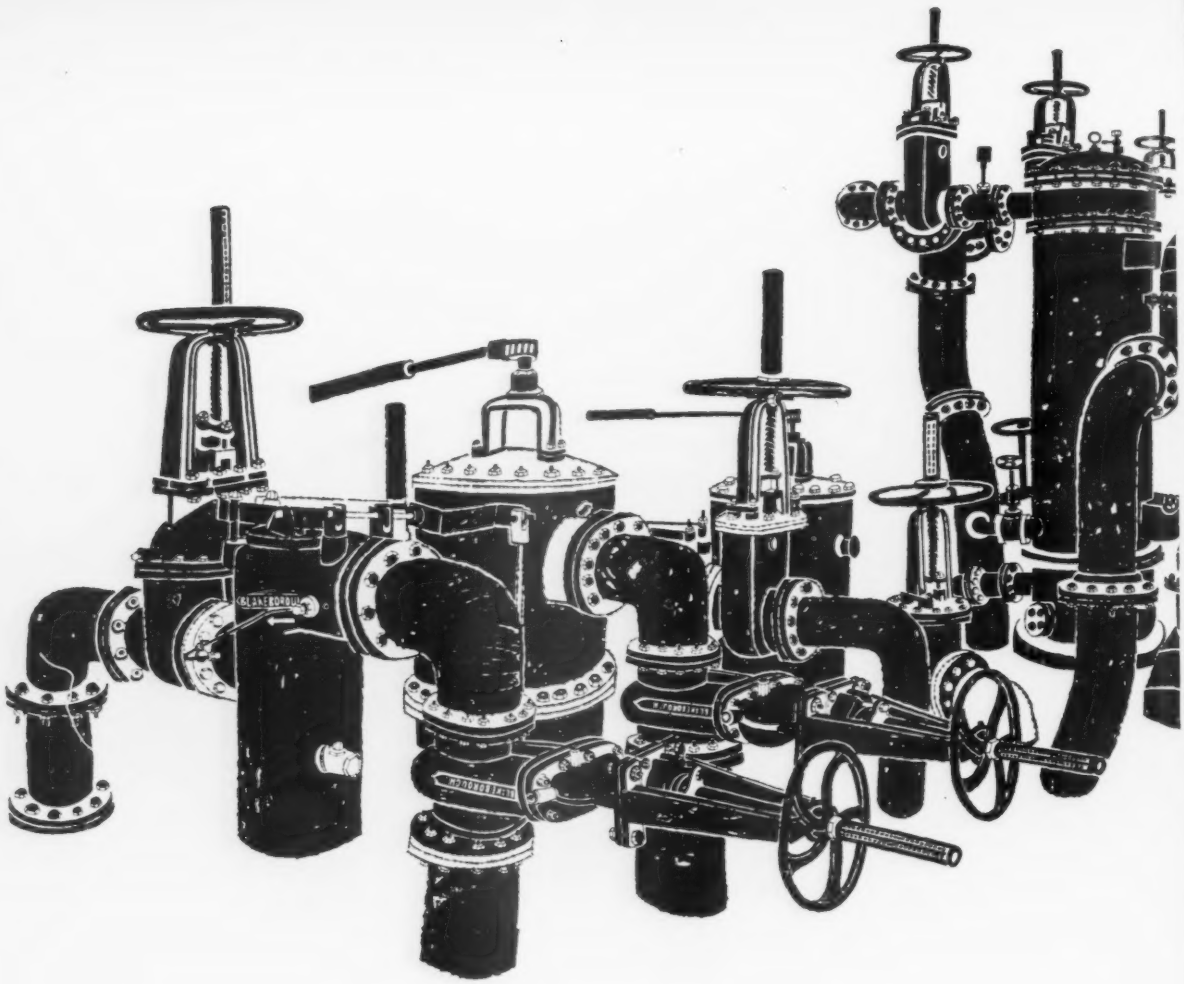

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More than £1,360 saved in a year at J. Blakeborough & Sons Limited

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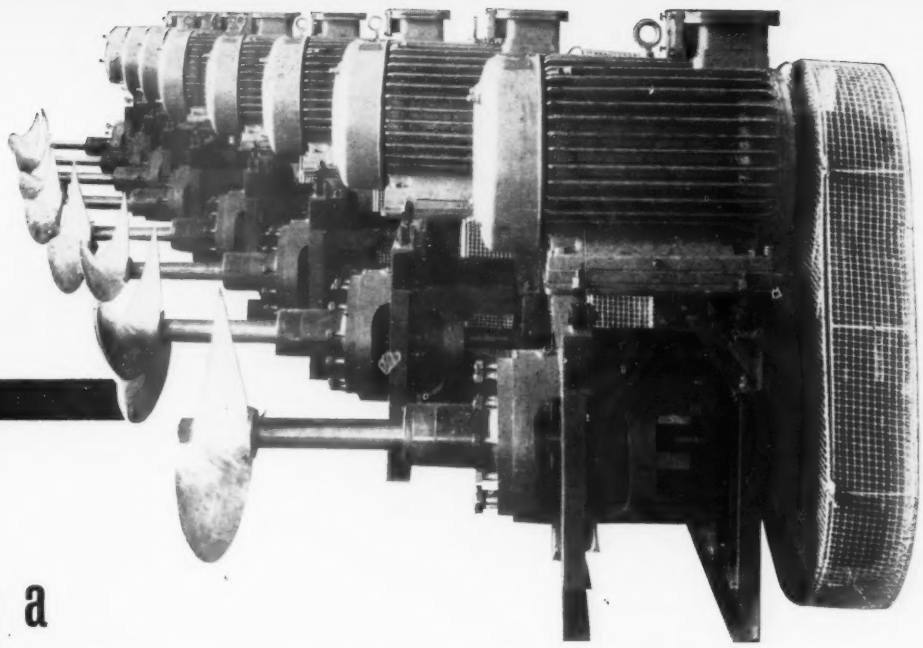

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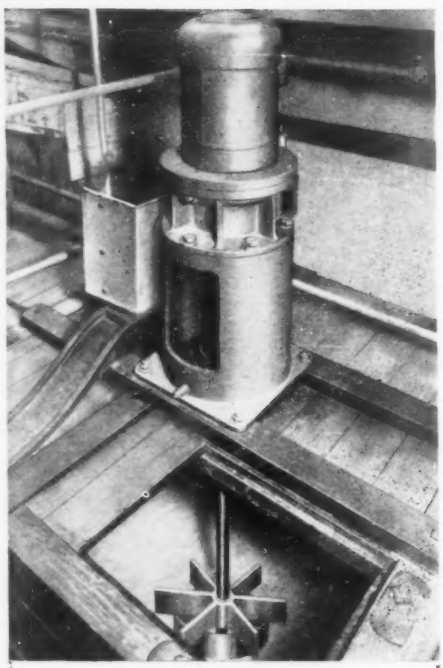
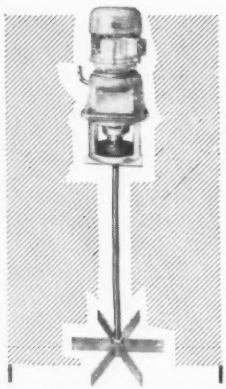
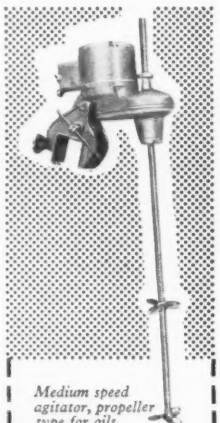


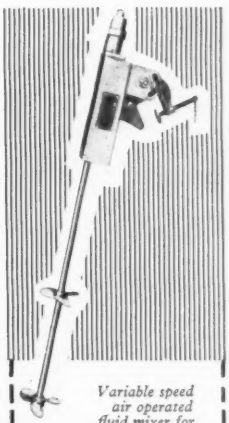
GVD type medium speed fluid mixer fitted with open type turbine impeller and stabiliser ring for oil and grease blending and for the inclusion of additives into lubricating oils.



Heavy duty 460 r.p.m. permanently mounted fluid mixer with turbine impeller.



Medium speed agitator, propeller type for oils and grease blending.



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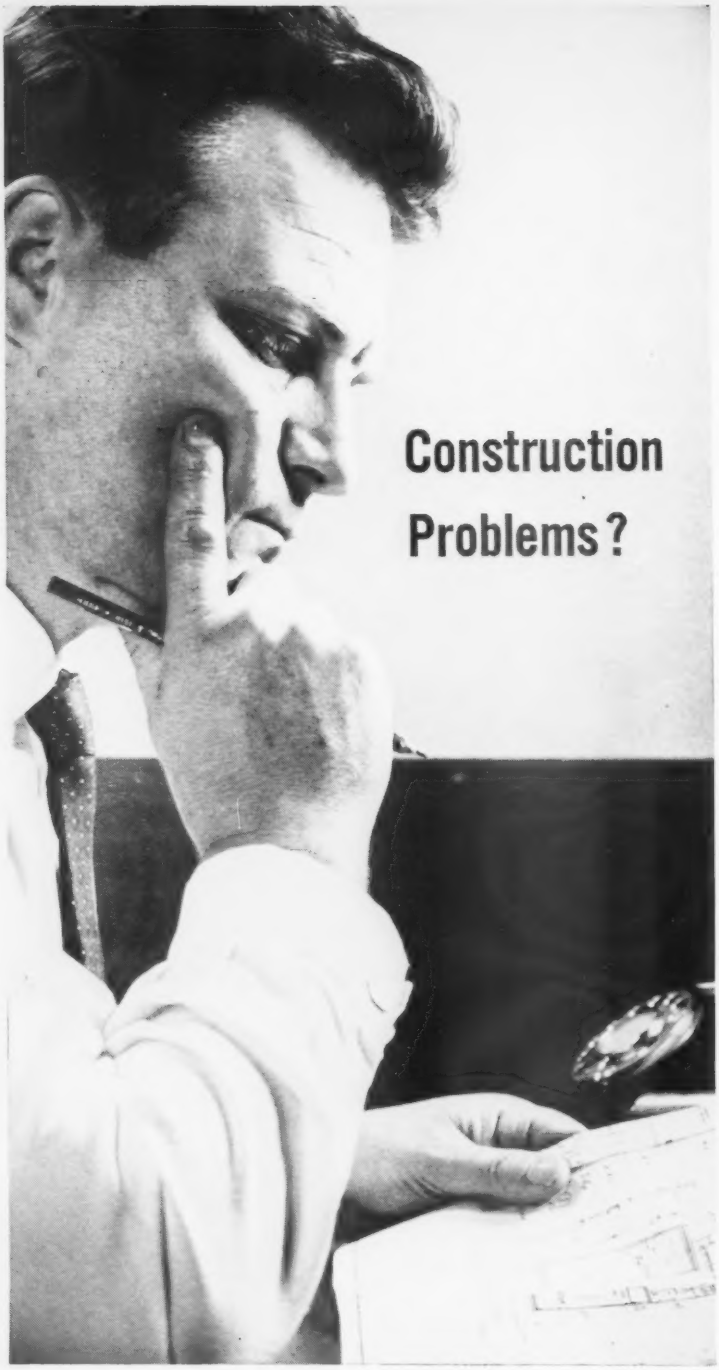

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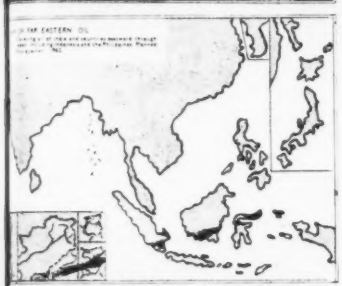

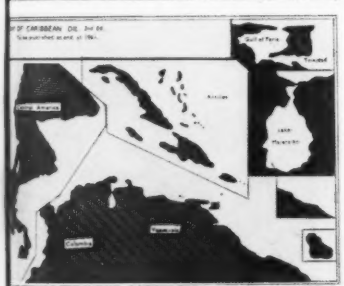

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MAP OF NORTHERN & MIDDLE AFRICAN OIL—Published mid-1961

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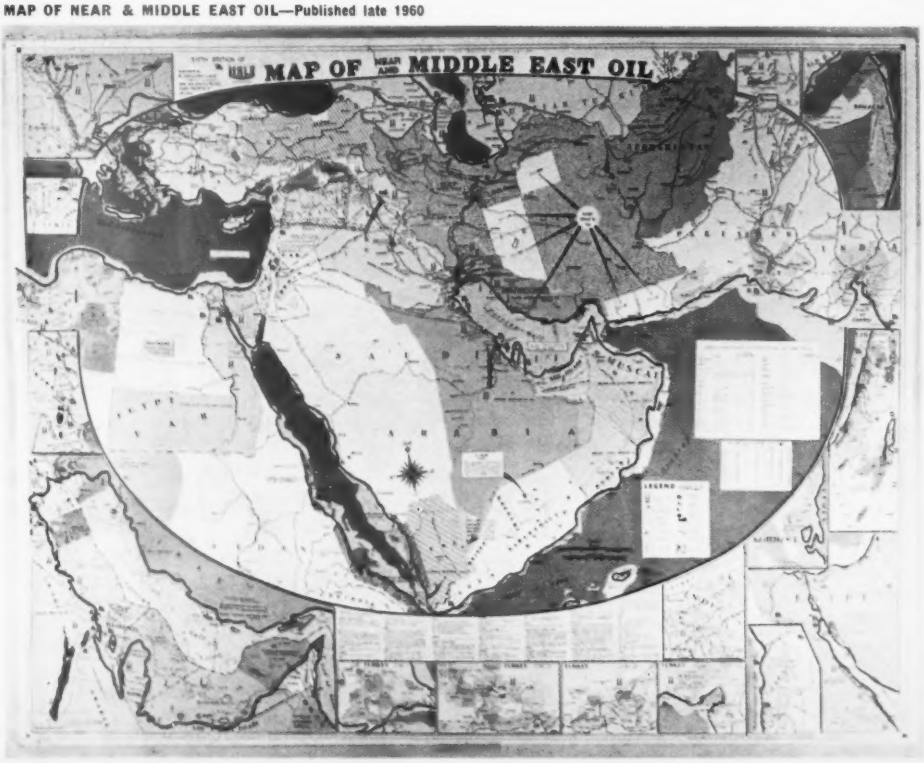
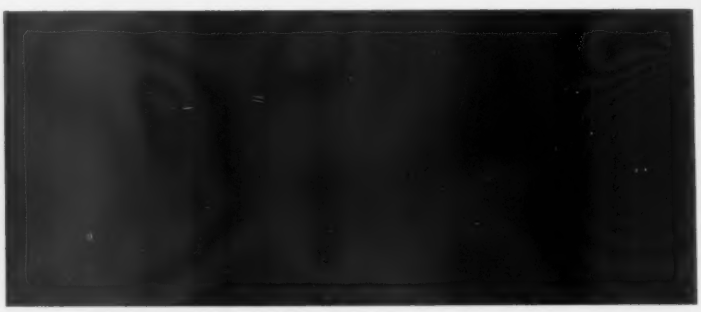
MAP OF NEAR & MIDDLE EAST OIL—Published late 1960



Sludge removal in AD 1436 Mr B



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Les Brown and Dave Davies are the British oil filtration experts. Ring them personally at Midland 7961 for advice.

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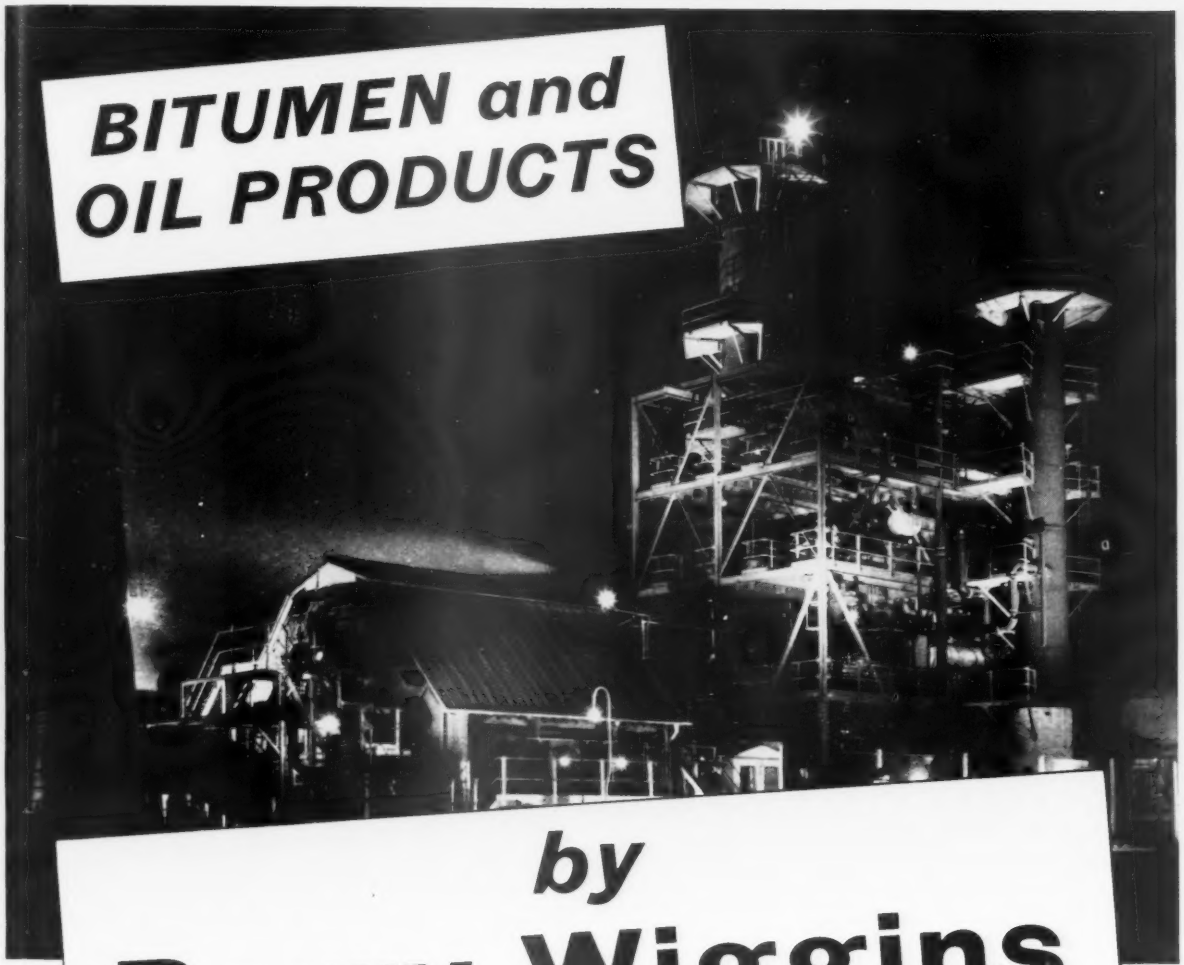

by Berry Wiggins

Night View of one of the Berry Wiggins Bitumen Refinery Units.

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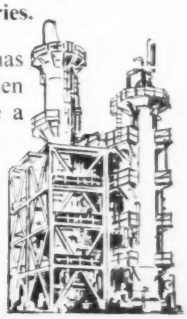

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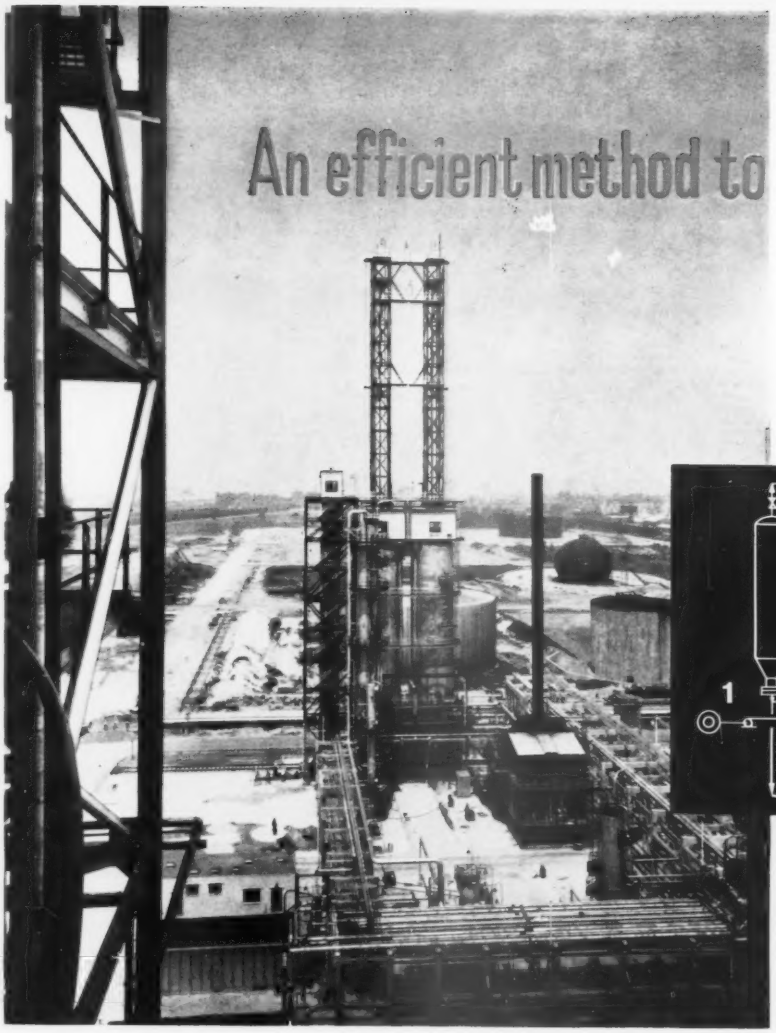

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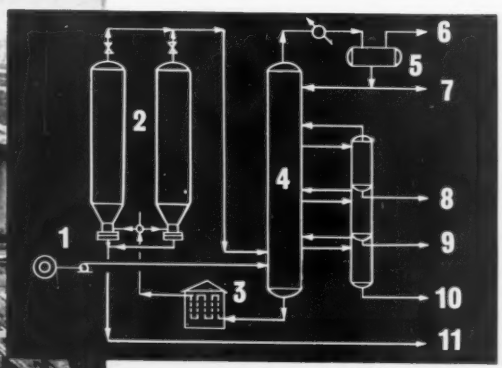

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Since 1936, 18 delayed coking units with a total design capacity just under 200,000 BPSD have been designed and built by Kellogg. Continual improvements, particularly in furnace designs, have contributed toward decreasing the investment and increasing the efficiency of the delayed coking process. The on-stream efficiency of Kellogg units is close to 95%.

Kellogg International Corporation welcomes the opportunity of discussing delayed coking in more detail with refining executives.

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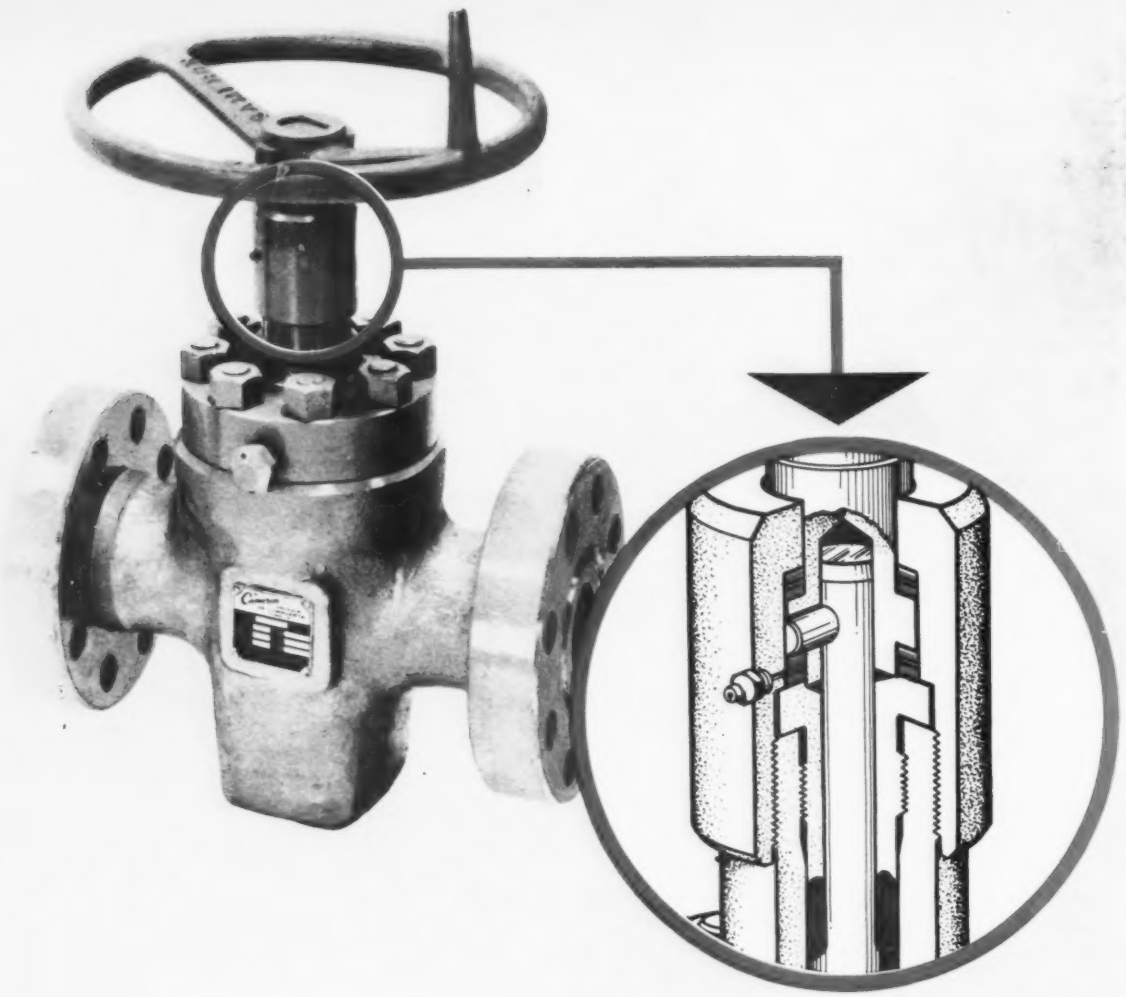

SAY GOOD-BYE TO FRICTION

Cameron's exclusive Type "J" packing now used in Type "F" Conduit Gate Valves has so little friction we are tempted to say "Good-bye to stem friction." Flexible Teflon, squeezed against metal surfaces by synthetic rubber, holds high pressure with almost no friction. Two needle bearings carry the thrust on the stem and that is another reason Cameron Type "F" Gate Valves are so easy to open and close.

Whether your problem is erosion, mild corrosion or very severe corrosion, one of Cameron's valve trims will give you outstanding service. Forged valve bodies and bonnets have superior grain structure and toughness making them the safest valves available. Long operating life without leakage is assured by the time-tested rotating seat design. When servicing eventually becomes necessary, the gate and seats are easily removed without special tools and without removing the valve from the line. It is no wonder that Cameron Type "F" Gate Valves are used on more and more Christmas trees.

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THE INSTITUTE OF PETROLEUM
REVIEW

Volume 15, No. 180 December 1961

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*The Development of the South-East Kuwait Oilfields**

By A. F. FOX†

In January 1952, a paper entitled "Some Aspects of Field Operations in Kuwait", written by E. Boaden and E. C. Masterson, was read before the Institute of Petroleum. In this paper a survey was made of the current drilling techniques, well completion methods, and production practices in the Burgan Field. During last autumn, I was fortunate in being able to make an extended tour of the Kuwait Fields, and in this paper I wish to describe some of the developments and improvements which have been made since 1952.

Although between 1952 and the present time further oilfields have been discovered at Raudhatain and Sabriya in North Kuwait and at Minagish in South-west Kuwait, the methods employed in them do not differ greatly from those used in the earlier discovered fields of Burgan, Magwa, and Ahmadi, which are all located in the South-east quarter of the State, and I have confined this paper to the older fields. The map at Fig 1 shows the positions of the various fields, and the relation they bear to the oilfields in the surrounding countries.

In addition to the oilfield development, the country itself has, of course, undergone considerable change over the years, and many of the improvements that have been introduced into oilfield practice have been made possible because of the rapid improvements in the facilities available.

Fig 1

Historical and Geological

A geological survey, on the basis of which the first wells were located, was carried out in the spring of 1935 by P. T. Cox on behalf of the British Petroleum Company (then the Anglo-Persian Petroleum Company) and R. O. Rhoades for the Gulf Oil Corporation. They located three oil or gas seepages on what they thought were crest maxima of a large uplift, and it was planned to drill a well near each of these seepages. The first well was at Bahra, north of Kuwait Bay, but was abandoned at 7950 ft; the second was at Burgan and entered the Wara sand in February 1938. Eight more wells were drilled before the events of 1942 caused a temporary suspension of operations in Kuwait, but development was resumed in 1945, and since then drilling has been continuous, with Burgan No 269 drilling to-day. The generalized stratigraphic column at Fig 2 shows the geological conditions encountered.

In 1948, when the development of the Burgan field was well under way, exploration was restarted, and a seismic reflection survey was carried out to establish the underground structure of the country surrounding the Burgan field. The survey indicated the presence of a second closed structure to the north of Burgan, and, in 1951, Magwa No 1 was drilled on it, proving the presence of oil in the Wara and Burgan sands. Subsequent development of this structure, called the Magwa field, has shown it to be an extension of the Burgan field. This seismic survey was carried over a

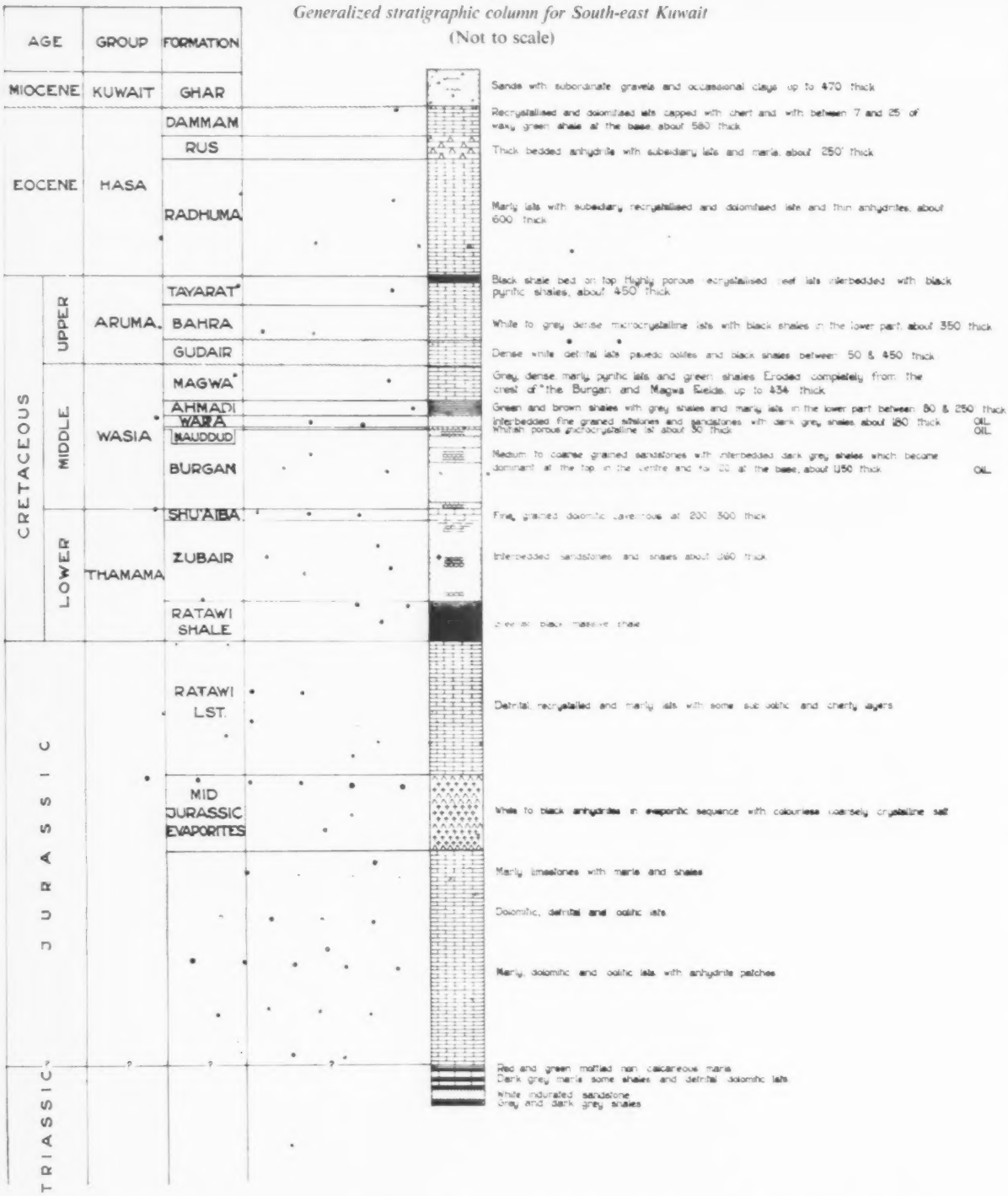
*Presented to the IP Exploration and Production Group on 21 February 1961.

†Kuwait Oil Company Ltd.

Fig 2

Generalized stratigraphic column for South-east Kuwait

(Not to scale)


AGE
GROUP
FORMATION
MIOCENE
KUWAIT
GHAR
Sands with subordinate gravels and occasional clays up to 470' thick
EOCENE
HASA
DAMMAM
Recrystallised and dolomitised lsts capped with chert and with between 7 and 25' of waxy green shale at the base, about 580' thick
RUS
Thick bedded anhydrite with subsidiary lsts and marls, about 250' thick
RADHUMA
Marly lsts with subsidiary recrystallised and dolomitised lsts and thin anhydrites, about 600' thick
CRETACEOUS
UPPER
ARUMA
TAYARAT
Black shale bed on top. Highly porous recrystallised reef lsts interbedded with black pyritic shales, about 450' thick
BAHRA
White to grey dense microcrystalline lsts with black shales in the lower part, about 350' thick
GUDAIR
Dense white detrital lsts, pseudo oolites and black shales between 50 & 450' thick
MIDDLE
WASIA
MAGWA
Grey, dense, marly, pyritic lsts and green shales. Eroded completely from the crest of the Burgan and Magwa fields, up to 434' thick
AHMADI
Green and brown shales with grey shales and marly lsts in the lower part between 80 & 250' thick
WARA
Interbedded fine grained siltstones and sandstones with dark grey shales about 180' thick
OIL
MAUDDUD
Whitish porous microcrystalline lst about 30' thick
OIL
BURGAN
Medium to coarse grained sandstones with interbedded dark grey shales which become dominant at the top in the centre and for 20' at the base, about 1150' thick
OIL
LOWER
THAMAMA
SHU'AIBA
Fine grained dolomitic cavernous lst 200-300' thick
ZUBAIR
Interbedded sandstones and shales about 380' thick
RATAWI SHALE
Grey to black massive shale
JURASSIC
RATAWI LST.
Detrital, recrystallised and marly lsts with some oolitic and cherty layers
MID JURASSIC EVAPORITES
White to black anhydrites in evaporitic sequence with colourless coarsely crystalline salt
Marly limestones with marls and shales
Dolomitic, detrital and oolitic lsts
Marly, dolomitic and oolitic lsts with anhydrite patches
TRIASSIC?
Red and green mottled non calcareous marls
Dark grey marls some shales and detrital dolomitic lsts
White indurated sandstone
Grey and dark grey shales

Note: The terms Ratawi Shale and Ratawi Limestone are names of convenience only, and will be replaced when correlation with type sections has been established.

prominent surface rise, the Ahmadi Ridge, east of Magwa and north-east of Burgan, but, with the techniques then in use, reflections could not be obtained from the Cretaceous strata which form the reservoir beds. However, during development drilling on the Burgan field, a close correlation had been established between the structure of the Dammam limestone (then called the Eocene upper limestone) and the Mauddud limestone (then known as the *Orbitolina concava* limestone) which formed the main Cretaceous marker, and a pattern of structural holes over the Ahmadi ridge was drilled to establish the form of the Eocene structure. It was found that there were three subsidiary crests along the main axis, and a deep well was drilled on each of them, each well being completed as a producer from the Wara or Burgan sands. Later drilling has shown that Ahmadi, Magwa, and Burgan form parts of one huge oil accumulation, though there are structural differences between each of them. To-day there are forty-seven wells on the Magwa structure and thirty-six on the Ahmadi ridge.

The structure of these fields as we know them to-day is illustrated by the two structural maps in Figs 3 and 4, which show the Burgan and the Magwa-Ahmadi fields respectively. In reading these maps, it must be realized that the well spacing employed precludes the accurate location of faults.

Among many geological problems in the South-east Kuwait fields still requiring solution, probably the most important is the discovery of a method by which the individual sand and shale beds, which comprise the Burgan and Wara formations, can be identified. The need for more accurate correlation of these individual sand layers is increasing now that edge and bottom water are rising to take the place of oil withdrawn, and the consequent falls in reservoir pressure are being offset by the injection of gas and surplus products. A typical electrical log of the producing formations in a Burgan well is shown at Fig 5, and the complexity of the sand-shale series comprising the reservoir beds can be easily seen.

Well Sampling and Logging

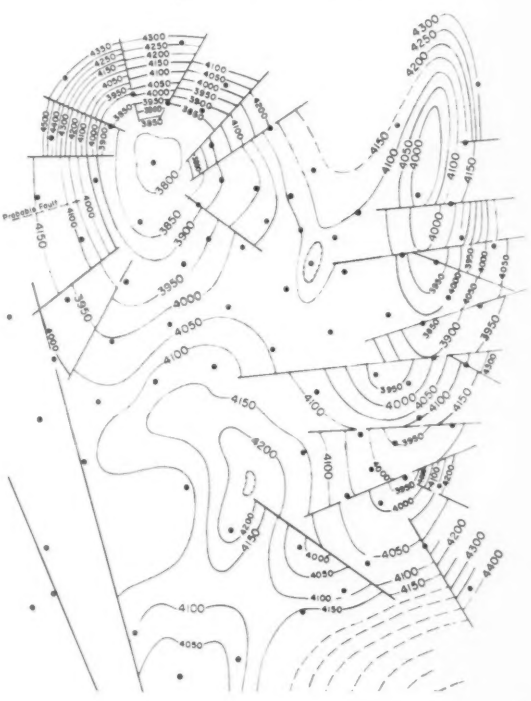
In the early days, all development wells were drilled at a 600-acre spacing, with a little over a mile between wells. It was then impossible to predict accurately the depths at which the various formations would be encountered in new wells, and, in order to ensure that casings were set at the correct depths, continuous ditch samples were collected at each well, usually at every 10 ft, but sometimes at 5-ft intervals or less. At the present time, with wells, which are normally within the proved area of the field, being drilled on a 66⅔-acre or smaller spacing with only about one-third of a mile between them, it is possible to be much more accurate in the prediction of geological horizons; and ditch samples are only taken for about 50 ft on each side of a few critical geological marker horizons. Cores have been taken from wells approximately on an 1800-acre spacing pattern over the whole of the

Fig 3

Structural contours on the top of the Mauddud Limestone, Burgan Field

Fig 4

Structural contours on the top of the Mauddud Limestone, Magwa and Ahmadi Field



developed area, but additional cores are still taken from time to time as techniques improve, in order to add to knowledge of the reservoir rocks.

Schlumberger Electric, Caliper, Scintillation Gamma Ray Neutron, and Laterologs are run in all wells, other specialized logs being taken when required.

Drilling

Since 1945, nearly all the wells in South-east Kuwait have been drilled with *National 50* rigs specially adapted and unitized in Kuwait to enable them to be mounted on caterpillar tracks, and moved across the desert. In the early days, these rigs were mounted on skids for moving, and required from 10 to 12 D.8 caterpillar tractors to move them, though this provided a considerable economy over the dismantling and re-erecting. Now they are mounted on *Athey* caterpillar tracks, and the whole of the derrick, including the draw-works and engines, can be moved by two D.8's, though more are normally employed. Fig 6 shows one of these rigs being moved across the desert from one location to another, and this method has enabled the time from completing one well to commencing the next to be reduced to as little as 24 hr.

At the time of maximum drilling activity in 1949, thirteen rigs were working, and a total of 241,771 ft was drilled. In 1960, 80,382 ft of hole were drilled and eighteen wells completed by two rigs. The rigs are manned by Kuwaiti drilling crews, only one European or American driller being employed with each crew. In fact, the first all-Kuwaiti drilling crew started working more than 12 months ago.

In 1945, a Burgan well took between 50 and 80 days to drill, but by 1952 this had been reduced to an average of 24 days, and this average has been maintained ever since, though some wells have been drilled in as little as 18 days. The decrease in drilling time was chiefly achieved by drilling the intermediate hole with water, utilizing the cuttings to block-off the considerable lost circulation zones encountered in this part of the succession. The casing pattern for a normal dual zone third and fourth sand completion comprises three strings of casing. A surface string of 16-in casing is set at about 250 ft to shut off the Kuwait series; then a second or intermediate string of $10\frac{3}{4}$-in casing is run into the Ahmadi formation (the cap rock shale) and set at about 3850 ft, serving to shut off all the lost circulation zones encountered above this depth. The final or production string of 7-in casing is run to about 4800 ft, cemented to the surface, and perforated with shaped charge perforations over intervals selected from electric logs. For single zone Wara sand completions, which are being drilled principally on the flanks of the field, the casing run is $13\frac{3}{8}$-in, $9\frac{5}{8}$-in, and $5\frac{1}{2}$-in, at approximately the same depths as for the dual zone completions.

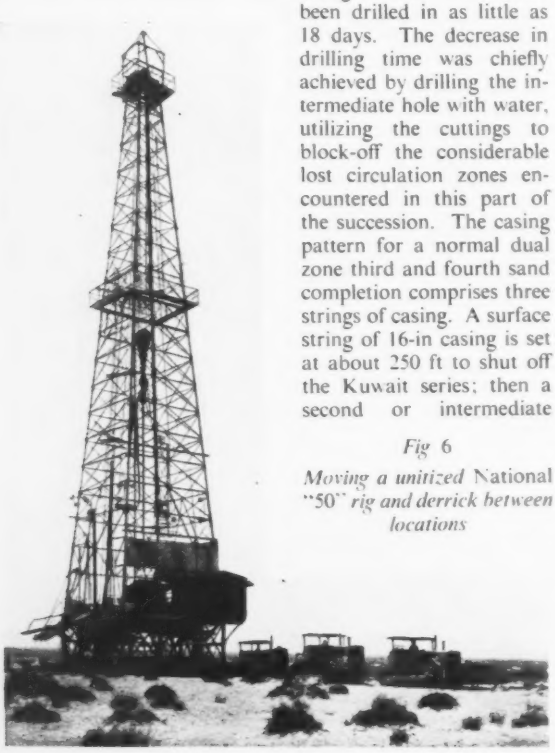
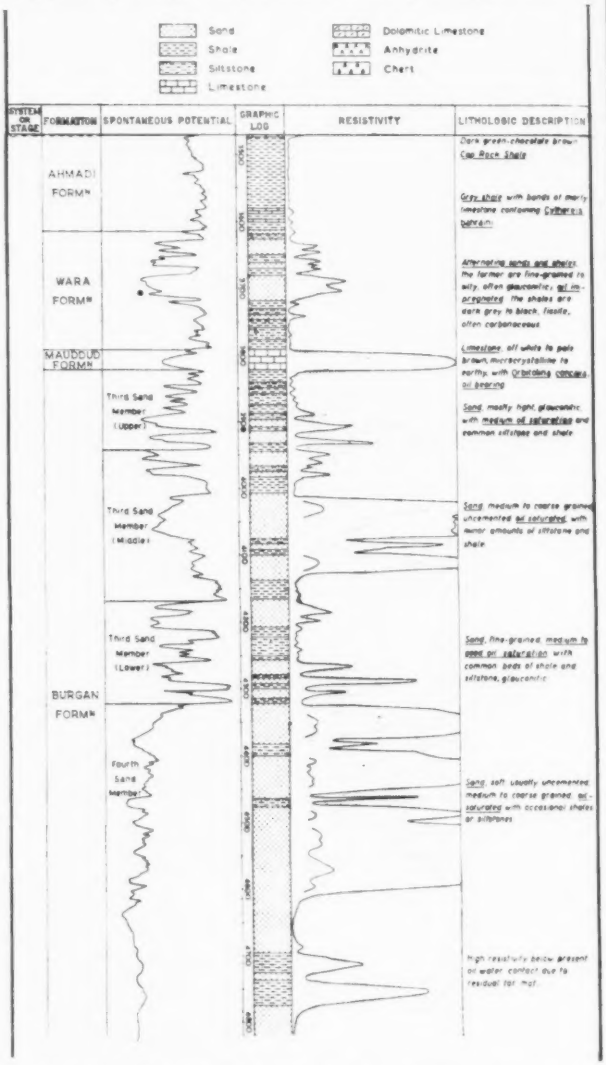


Fig 6

Moving a unitized National "50" *rig and derrick between locations*

Fig 5

Typical log through the productive series of a Burgan well


Sand
Shale
Siltstone
Limestone
Dolomitic Limestone
Anhydrite
Chert
SYSTEM OR STAGE
FORMATION
SPONTANEOUS POTENTIAL
GRAPHIC LOG
RESISTIVITY
LITHOLOGIC DESCRIPTION
AHMADI FORMN
WARA FORMN
MAUDUD FORMN
BURGAN FORMN
Third Sand Member (Upper)
Third Sand Member (Middle)
Third Sand Member (Lower)
Fourth Sand Member
Dark green-chocolate brown Cap Rock Shale
Grey shale with bands of marly limestone containing Cyclammina balrami
Alternating sands and shales, the former are fine-grained to silty, often glauconitic, oil impregnated, the shales are dark grey to black, fissile, often carbonaceous
Limestone, off white to pale brown, microcrystalline to earthy, with Orbitolina concava oil bearing
Sand, mostly light, glauconitic with medium oil saturation and common siltstone and shale
Sand, medium to coarse grained, uncemented oil saturated, with minor amounts of siltstone and shale
Sand, fine-grained, medium to good oil saturation with common beds of shale and siltstone, glauconitic
Sand, soft, usually uncemented, medium to coarse grained, oil saturated with occasional shales or siltstones
High resistivity below present oil water contact due to residual tar mat

Well Completions

Wells are completed either as dual zone producers from the Wara and third Burgan sands, or from the third and fourth Burgan sands and, on the flanks of the field, as single zone Wara sand producers.

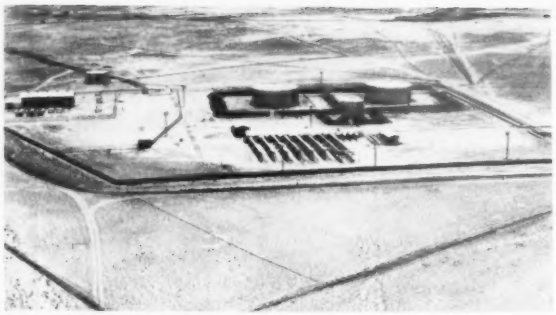


Fig 7

Gathering Centre No 9 *at Magwa, a seven stage centre with BP inclined separators. The incoming flowline manifolds are on the right of the separators with the (now disused) transfer pumps at their left hand rear, while the main transit pump house is on the extreme left of the picture. The tank outside the perimeter fence is for water storage in case of fire*

In the case of the dual zone completions, $3\frac{1}{2}$-in tubing is run in the hole, with a Lane wells production packer separating the two zones of production. In the dual zone Wara and third sand producers, where the third sand has a productive capacity considerably in excess of the Wara sand, an Otis cross-over packer is also included in the string above the production packer to enable the oil produced into the tubing from the third sand to flow through the larger area of the casing annulus with less loss of energy.

The single zone Wara sand completions have either a $5\frac{1}{2}$-in production string, with five pre-slotted joints immediately above the shoe, or are open hole completions with the $5\frac{1}{2}$-in casing set in the top of the Wara sand. In either case, $2\frac{3}{8}$-in tubing is suspended about 10 ft above the bottom of the hole, a perforated nipple being incorporated where the hole is cased. Single zone completions are produced through both tubing and casing simultaneously, in order to equalize the drawdown over the perforations, and to prevent the sand being deposited at the bottom of the well. The several flow wings at each well are joined into a common flowline at the wellhead, these normally are 6-in od, and in some cases two or more wells with small productivities are connected into the same flowline.

Production Facilities

There are now fourteen gathering centres in the South-east Kuwait fields, having a maximum theoretical throughput of 2·2 million bd.

The first gathering centre was erected near Burgan No 1 in 1946. It is a three-stage centre working at 125 psi, 40 psi, and atmospheric pressure, and incorporates both vertical and horizontal separators. It was designed locally to enable the equipment which was immediately available at that time to be used.

No 2 centre was specially designed to give the optimum recovery of light ends, and was arranged with Parkersburg horizontal separators working in six stages at 425, 200, 100, 50, 25, and 10 psi, with the seventh stage at atmospheric pressure in the flow tanks. In practice, the separator pressures were found to require adjustment according to the throughput, and eventually the best operative pressures were found to be 60, 33, and 12 psi in the fourth, fifth, and sixth stages, with the other stages unaltered. This centre was completed in October 1948.

Centres 3–10 were erected between 1949 and 1953 on a common pattern of seven-stage separation, using BP inclined separators which had originally been designed for use in Persia but which were found to function admirably under Kuwait conditions, and Fig 7 shows the layout of No 9 centre.

In 1953, the design of gathering centres was re-examined and a new type of three-stage centre was evolved. The new design was used in centres 11–14 erected after 1956 (No 14 was commissioned in August 1959) and used the BP pattern of inclined separators working at a first-stage pressure of 425 psi, a second-stage at 40 psi, with the flow tanks again at atmospheric pressure. This design was considerably cheaper and had the particular advantage of cutting out the transit pumps which in the seven-stage system were required to lift the oil from the last separator to the tanks. The layout is shown in Fig 8. Concurrent with the building of the new three-stage centres, the older seven-stage centres were modified to work on three stages.

Recently some of the Wara sand wells have been unable to flow against the back pressure of the 425 lb first-stage separators. Gathering centre No 2 has, therefore, been modified so that these low pressure wells can be flowed into a first-stage separator at 125 psig, thereafter having a second 40-lb stage, and being led to a common third stage in the tankage. This modification utilized separator vessels of the seven-stage arrangement which are by-passed when the centres are operated on three stages.

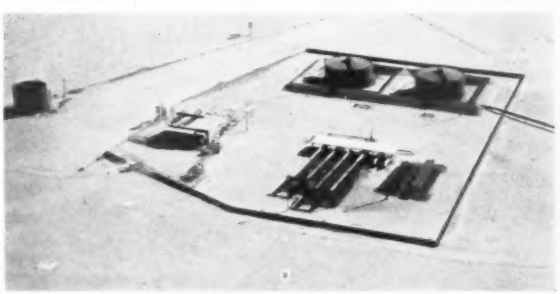
Gas Utilization

Up to the present time, the gas necessarily produced with the oil has been used for providing power for Kuwait Oil Company installations, for the Kuwait State electricity power station and its water evaporation plant, and for a growing number of industrial undertakings in and around Kuwait Town. Now, however, a gas injection plant is being commissioned, and this will compress and return to the reservoir 100 million cu ft/day of gas taken from the outlets to the high-pressure first-stage separators at 400 psi.

A plant to manufacture liquefied petroleum gas from the rich tank vapours which are discharged at atmospheric pressure is also under construction. This plant will take the tank gas from three centres at a rate of about 21 million cu ft/day and compress and condense it to 8750 brl of condensate in the field. It will then be pumped to the refinery at Mina-al-Ahmadi, where it will be separated to butane, propane, and

Fig 8

Gathering Centre No 13 (*Burgan*). *The various units are in the same relationship to one another as in Gathering Centre No* 9. *The whole layout is, however, simpler and more compact*



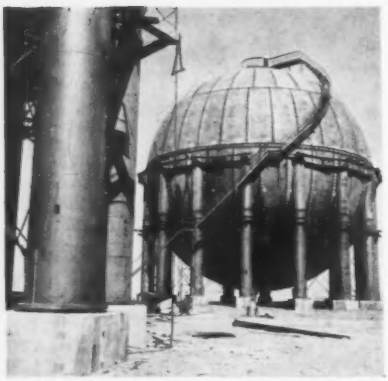


Fig 9

One of the two 65,000-brl Hortonspheres for LPG storage during erection

natural gasoline, and refrigerated and stored in special insulated storage until shipped or used locally. Fig 9 shows one of the 65,000 brl Hortonspheres designed for this LPG storage in course of erection.

Pump Stations and Pipelines

Each gathering centre includes a pump station from which the crude oil is pumped to the Ahmadi tank farm. The earlier centres are all powered by internal combustion reciprocating engines; one, No 8, by gas expansion turbines, and four Nos 11, 12, 13, and 14, by gas combustion turbines either alone or in conjunction with IC reciprocating engines or electrical motors.

The pumps are all centrifugal type and deliver to the Ahmadi tank farm through four transit lines, two being 20-in, one a combination of 20-in and 22-in, and a third a combination of 30-in and 34-in. Recently, production from North Kuwait has necessitated the provision of additional tankage, and a new tank farm has been built north of the town of Ahmadi to supply the north loading pier. Pipeline connexions either have been or are being provided so that crude from all the producing fields can be directed into either tank farm.

Electrification

Electrical power is at present supplied through an overhead power line to the fields from the main steam power station at Mina-al-Ahmadi, but a new power station containing two 7500 kW generators powered by gas combustion turbines is now being built at Burgan, and will, in the future, supply the fields' power requirements, and also act as a stand-by to the main station. Fig 10 shows the combined power station and gas injection pumphouse under construction.

Reservoir

With continued production at sustained high rates, water has been replacing the oil withdrawn, and has risen sufficiently high at some places in the reservoir to be drawn up into the lowest well perforations and produce with the crude oil. This has two bad effects on the crude, first the salt content is increased beyond that which is acceptable for refining, and secondly a very stable water-in-oil emulsion is formed.

At present the problem is solved by plugging back the lower perforations of any well affected, until water and salt-free production can once more be obtained. It is thought, however, that there may come a time when the restriction on production caused by the loss of perforations will be too great to accept and, in order to study the possible methods of dealing with wet crude, a pilot treating plant has been set up at one of the gathering centres. It is designed to treat up to 10,000 bd of fluid. The plant has been specially designed for portability, with each separate unit skid-mounted and the pipework arranged so that it can be knocked down and moved in sections immediately ready for re-assembly.

In this plant the wet crude is heated, washed with water, and the water and salt removed either by an electrical or a chemical process, or a combination of both. The plant is now being commissioned, and it is hoped that by its use the economics of wet crude treatment can be studied, and the best techniques evolved in case the problem becomes urgent in the field.

If it does become necessary to produce wet crude, it will probably be necessary to segregate the "wet" from the "dry" oil in order to keep the volume of crude needing treatment as low as possible. It will then be an advantage to know when a well is starting to produce water, so as to be able to divert its production into the "wet" crude stream, as now it would be useful if warning could be obtained so that a well could be shut in just before producing water rather than just after. At present, after the identification of the oil-water interface from cores or logs when each well is drilled there is no method of following its later movement until it has risen far enough for water to enter the lowest perforation in a well. A logging tool which registers responses to the gamma rays emitted by hydrogen and chlorine when under neutron bombardment has recently been devised by the Research Department of the British Petroleum Company Limited for use in Kuwait. When this instrument has been developed into a field apparatus, it will be possible to run into any well while still under pressure (though not while flowing), and to record the depth where an increase in the chlorine response indicates the position of bottom water.

DISCUSSION

Mr Fox was asked whether any consideration had been given to automatic centralized control of gathering centres in Kuwait, and replied that theoretical studies showed that it might not be worthwhile to have a central control. What would probably be best would be to have an automatic system of failing for each individual operation at each gathering centre, so that if anything did go wrong each separate process would close down in cascade.

In reply to a question concerning the effect production had had on flowing pressure, and the effect of the appearance of water in the wells on flow characteristics, Mr Fox said that there had been a pressure decline in the reservoir, and that although this was continuing, it was not causing concern, because of a very good

Fig 10

The combined power station and gas injection plant on the Burgan Field. The power station is on the left and the injection plant on the right

water drive. The effect of water being produced in a well was not known from practical experience, because as soon as water was detected in a well the rate of production was reduced until the water dropped out, or else the well was shut in completely until it could be worked over and the water excluded. Mr Fox said, however, that if water were to be produced in any volume in a well, the flow characteristics would change because of alterations in the physical character of the column of fluid in the well bore.

The author was then asked what was the reason for changing from the 7-stage gathering centre down to the 3-stage centre. He said that although the 7-stage separation gave an increase in API gravity of the crude, it also gave an increase in the Reid vapour pressure, and difficulties were experienced in shipping because of this. Other reasons were that the increase in API gravity was not commensurate with the cost of erecting a 7-stage centre, and that 7-stage centre throughput was restricted because of the seven stages. The 3-stage centre, which was very much smaller, gave the same throughput.

The next question referred to the large casing sizes, and Mr Fox said that these were dictated by the amount of oil that had to get up through the production string. Slim hole completions had been considered but did not appear to offer any great advantage.

The same questioner asked whether there was any refrigeration of LPG in compression and cooling, which, he assumed, was the way in which casing head gasoline was extracted. The author said that he presumed this was a reference to the field compression, where cooling was by crude oil, but explained that refrigeration of LPG took place only in the refining stage.

Dealing with a reference to air drilling, Mr Fox said that some small experiments in air drilling had been tried in seismic shot holes, but it appeared that the formations were not suitable for air drilling.

On the question of multiple completions, Mr Fox said that these had not been tried with more than two zones producing in the same well. The nature of the producing formations indicated that any such completion would reduce, not increase, the well capacities, because of the increased restriction in the casing.

The next question concerned correlation between the sands, and the author replied that, whether one said that the reservoir was a sand with lenticular shales, or a shale with lenticular sands, depended on how one started to correlate. If X were to start with a large number of logs, and to work on correlating shales, the chances were that he would come up with the answer that the shales were continuous, and the sands lenticular. If, on the other hand, he were to work through the sands, and correlate them, he would come to exactly the opposite conclusion, that it was a large sand body with lenticular shales. Mr Fox said that he thought that there were communications right through from top to bottom, at least in the Burgan formation, *i.e.* below the Maudded limestone. There were holes, he thought, in all the shales through which the oil could communicate with the sand bodies immediately above and below. And by tracing a very tortuous path across the reservoir, oil could move from one sand to any other sand.

On the other hand, he said, it would appear from the electric logs that some of the shales were remarkably persistent. They appeared to extend over very large areas. In some cases when correlating along a line of wells, one could find a well which correlated, not with the next one, but with one removed from it. This was particularly noticeable in the Wara sands, and he felt that in those cases the formation was originally laid down continuously, had then been channel-eroded by some sort of distributory, and had later been filled up very much more quickly by deposits of a different nature.

The increase in gravity towards the bottom of the reservoir was something which, he thought, could not have occurred by segregation in the reservoir because of the persistent shales, which, although they might not have completely precluded segregation, would at least have provided local interruptions. So that if the segregation had taken place in the reservoir, it would be possible to find some sand bodies which showed their own gravity distributions. It had not been possible to demonstrate such differences in the Southern Kuwait fields, but because the testing was necessarily not very accurate, one could not conclude that it did not exist. It was not possible to take samples at very close intervals through one individual sand, since mechanical difficulties and the cost of the operation precluded it. This made it impossible to demonstrate exactly what the distribution of the crude was in the reservoir. But, it did seem to him that the very steady variation of gravity could only take place if the crude had gone into the reservoir already segregated, so that the earlier crude was lighter than the later.

Around the Branches

ABADAN, BAHRAIN, ESSEX, FAWLEY, KUWAIT, LONDON, NORTHERN, SCOTTISH, SOUTH-EASTERN, SOUTH WALES, STANLOW, TRINIDAD, YORKSHIRE

Essex Branch

A party of branch members paid a visit to Cambridge on 20 September. The trip included a conducted tour of some of the colleges in the University during the morning, and a visit to the Granta works of W. C. Pye and Unicam Ltd in the afternoon.

A pleasant surprise made a good start to the day, for on arrival in Cambridge Mrs E. Murray, a member of the party, was presented with a bouquet and chocolates for becoming the 5000th person to visit the University under the auspices of the travel agency during the summer season. Following this ceremony, the party was taken on a very interesting tour round five colleges by a well informed student guide.

An excellent luncheon in the town was followed by a visit to the works of W. C. Pye and Unicam Ltd which are situated some 2 miles from the centre of Cambridge. The development laboratories and manufacturing workshops of these famous instrument makers were visited, and a comprehensive description by the guide ensured that the visit was most interesting to both technical and non-technical members of the party.

This concluded the organized itinerary of the outing, and the journey back to Essex and home began soon after tea. It was generally agreed that the day had been a great success because of the varied interest and had been enjoyed by all.

The 1961–62 session opened on 4 October with a talk by D. Hurden, research manager of the De Havilland Engine Company, on the subject of "The Uses and Limitation of Petroleum for Space Flight". He began by confessing that having submitted his title, he realized, when preparing his talk, that in the light of present thinking, the limitations of petroleum tended to outweigh its uses.

In tracing the early history of rocketry he described various lines of experiment where the fuels used were liquid oxygen and petrol or kerosine. In the later 30's much of the work was taken over by the armed forces, notably at Peenemunde under Von Braun, and alcohol became favoured in place of kerosine. This was partly because of a shortage of petroleum products in Germany, but more particularly because, with equipment then available, the lower flame temperature of the alcohol–oxygen was less liable to cause burn out.

At the end of the 1939–45 war rocket development

continued, the German effort being taken over in part by the U.S.A. and in part by the U.S.S.R. Improvements in combustion chamber design now enabled kerosine–oxygen fuels to be used, and advantage to be taken of the increase in exhaust velocity given by this mixture. Increased pay-load demands, however, soon necessitated replacement of this with oxygen–hydrazine (in liquid form), a fuel which itself now seems likely to lose in favour of liquefied oxygen and hydrogen.

He concluded by indicating that the petroleum industry need not feel too concerned at this loss of markets in the rocketry field since volumes were extremely small, and by indicating that the space engineer was looking toward the industry for supplies of hydrogen.

Mr Hurden kept an audience of thirty six members and friends keenly interested in his talk, as was shown by the number of pertinent questions put to him at the conclusion of his address on a subject on which he is most obviously an authority.

South Wales Branch

On 21 September, the Branch combined with the South Wales Branch of the Royal Institute of Chemistry to visit the Esso refinery at Milford Haven. The party was entertained to lunch and then taken on a tour of the refinery and jetty terminal. All the members were fascinated by the up-to-date lay-out of the refinery and the novel methods of operation.

After tea, the party, augmented by Esso refinery staff, were addressed by A. Anderson, A.R.T.C., A.R.I.C., of Milford refinery on "Production of Ammonia from Petroleum Feedstock", and by G. Drake, M.A., S.M., A.M.I.Chem.E., of Fisons Fertilizers Ltd on "Modern Processes for Nitric Acid Production".

In his talk, Mr Anderson described the common methods used to manufacture the ammonia synthesis gas mixture from petroleum feedstocks, and briefly covered the range of processes available to convert the synthesis gas to ammonia.

He said that the three types of processes used to produce the N_2:$3H_2$ gas mixture from which ammonia is synthesized are:

Hydrogen separation from naphtha reformer tail-gas, which is accomplished by refrigerating out the impurities from the hydrogen then adding the correct amount of nitrogen from an air separation plant.

Partial oxidation, which can produce hydrogen from any petroleum stream. Ninety five per cent pure oxygen from an air separation plant partially oxidizes the petroleum to hydrogen and carbon dioxide. The hydrogen is then purified and nitrogen, also from the air separation plant, is added to make the synthesis gas. Partial oxidation is the only process available for converting heavy oil, *e.g.* bunker C, to synthesis gas.

Steam reforming, which is used only on gas or LPG to produce hydrogen from the hydrocarbons and steam over a nickel catalyst. In this case, the nitrogen required for the synthesis gas is obtained from air, which is added in a secondary reforming stage to complete the reforming reaction. No air separation plant is required.

Regarding the processes to convert the synthesis gas to ammonia, most are developments of the original Haber process. A promoted, iron catalyst is used at about 900 F. Only a fraction of the recycled synthesis gas is converted to ammonia at each pass. The processes offered by the various contractors can be classified by the internal details of the ammonia convertor to allow for temperature control, and by the pressure range, which can be "low pressure" (*ca* 1500psi), medium pressure (*ca* 5000psi) or high pressure (*ca* 15,000psi).

A summary of the talk by Mr Drake will appear in a future issue.

Fawley Branch

Those members, families, and guests, of the Branch who were able to join the outing on 23 September were rewarded by having a most enjoyable day. The weather was kind throughout the day, adding to the pleasure of a successful venture.

The party first visited the Esso Technical Sales Department at Feltham. Small groups were escorted round the various sections by very knowledgeable and very patient guides, who had given up their morning off for this purpose. Of particular interest were the spectrograph, used for high speed analysis of lubricant additives, etc.; the engine laboratory, where fuel ratings assessments are carried out, and the boiler laboratory, where a number of makes of domestic boilers and burners were undergoing tests. The party then enjoyed pre-lunch liquid refreshment, followed by an excellent lunch, as guests of the Technical Sales Department.

The next port of call was London Airport, where the party made a walking tour round the B.O.A.C. Maintenance Base, followed by a welcome sit down inside a Boeing 707. Many of the party were somewhat astonished at the facts and figures reeled off by the B.O.A.C. guide on the organization of B.O.A.C. in general, and about the Boeing 707 in particular. Truly a monumental organization.

The latter part of the London Airport visit was taken up by a conducted coach tour of the airport, and a visit to the control tower. A well informed Ministry of Aviation guide explained the method of aircraft control by means of radar screens, etc., and the party left the control building much more enlightened on this aspect of aviation.

Stanlow Branch

The Branch officers for the 1961–62 session are A. S. Brooman, chairman, J. E. Winterbottom, honorary secretary, and V. Biske, honorary treasurer. It will be recalled that in the original list of officers submitted by the Branch and published in the October 1961 *IP Review* the posts of Messrs Winterbottom and Biske were reversed.

Dr T. S. McRoberts, of Shell Chemical Company Plastics Division, delivered his lecture entitled "Plastics Related to Petroleum" to a joint meeting of the Branch with the North Lancashire Section of the Royal Institute of Chemistry at the Grosvenor Hotel, Morecambe, on 29 September.

INCREASE IN IP REVIEW SUBSCRIPTIONS

It is regretted that, owing to the fact that several sizeable increases in printing costs have occurred in the last few years, the price of the *IP Review* to non-members of the Institute will be increased as from the January 1962 issue. The new price will be, annual subscription 25*s*, individual copies 2*s* 6*d*.

Dr McRoberts began by outlining the early development days of the petroleum chemicals industry, initially dependent upon the by-products from the petroleum industry cracking plants, and later producing its own starting materials for specific purposes. This is not without its problems, as in the case of propylene, where a rapidly expanding demand in Europe for both solvents, propylene oxide and polypropylene, could well cause a shortage of propylene in the not distant future.

The plastics industry, and in particular the thermoplastics industry, has played a leading role in accelerating these developments. Existing outlets for plastics in the packaging, building, and engineering industries were capable of considerable development, quite apart from other outlets.

The speaker continued by outlining the enormous problems, amount of work and order of cost in developing a plastic from the original discovery to the successful marketing of the product at a fair return on capital. Development times are reducing, he said, *e.g.* polystyrene took 100 years, whereas nylon took 10 years, polyethylene 5 years, polypropylene 3 years from initial discovery to commercialization.

Improvements in process techniques and new processes such as Ziegler's heterogeneous catalysis, etc., have produced plastics of improved quality and versatility, and it could be said that any polymerization theoretically possible might one day be a commercial success. After initial discovery, a major effort is required to develop the polymer through the next stage, where exhaustive testing of pilot plant scale quantities requires a highly developed integrated test progamme. The lecturer indicated the basis of the evaluation scheme and the properties between which the proper balance must be struck for a particular end product. In concluding, he drew attention to the fact that even while a manufacturing unit was under construction development of new grades continues; in some cases these require processing modifications. Development of a thermoplastic requires a persistent and continuous effort which does not stop with the construction of a new plant.

Scottish Branch

The Scottish Branch held its first meeting of the 1961–62 session in the North British Hotel, Edinburgh, on 5 October.

Dr W. B. Peutherer, chairman of the branch, presided and introduced the speaker, Ian Hamilton, whose subject was "Recent Welding Developments of Interest in the Pressure Vessel Industry".

The speaker dealt with certain weld developments which have taken place in the last decade, and which are of special interest to the pressure vessel industry. The first welding process described was the Russian electro-slag process, which was discussed at a conference on the "Application of Low-Alloy Steels for Welded Pressure Vessels" held in Glasgow in 1956. This method is a vertical machine welding process with an extremely high production rate, which utilizes the electrical resistance of the molten flux to melt both the electrode and the plate edges. The resultant weld has a very coarse metallurgical structure, and to develop the full mechanical potential of the weld metal it is necessary to subject the weld to a normalizing treatment, instead of the more conventional heat treatment of stress relief applied to Class I welds. Nonetheless, the mechanical properties of electro-slag welds in the "as welded" condition are such that, for many applications, no post welding heat treatment need be applied.

The necessity of handling more and more corrosive liquids and gases in pressure vessels has resulted in the development of weld deposition cladding of plates, in order (a) to economize in the use of stainless steel, and (b) to permit the fabrication of thick vessels to work at high pressures. Various methods of deposition were briefly described and it was stressed that the dilution effect between ferritic plate and austenitic weld deposit could become a major problem. It was shown that techniques had been developed to minimize this phenomenon.

Northern Branch

The 1961–2 programme had a successful beginning when the first meeting at the Old Nags Head Hotel welcomed George Sell on 17 October. In a convivial atmosphere, and with E. R. Wilson in the chair, Mr Sell had the close attention of all those present as he unfolded his story of "Fifty Years in the Oil Industry". Branch members enjoyed meeting and listening to an old friend whom they had come to know so well through the medium to which he devoted many of his fifty years, namely the *IP Review*, of which he was editor until his retirement earlier this year.

Ladies Night at the Institute

For some time it had been said that many wives had expressed a wish that an opportunity could be arranged for them to look over the home of the Institute. They had heard a great deal about it from their husbands—who often spent a considerable portion of their time there—and they had probably attended Institute Summer Meetings but never had a chance to look at the Institute itself.

In order to meet this wish an "at home" was held for members and lady guests at 61 New Cavendish Street on 20 October last. Commencing with a buffet tea, visitors were able to have a "free run" of the building. The eighty or so people who attended the function expressed considerable interest in the building, as can be seen in these photographs, and their curiosity was frequently met, and possibly sharpened, by the typesheet history of the homes of the Institute which was available to them.

The painted Adam ceilings in the President's room, and the Library and Members Reading Room were objects of particular interest in their look around the building. Visitors also were able to get an introduction to some of the behind-the-scenes day-by-day work of the Institute by looking over the offices of the various departments.

When visitors had thoroughly exhausted, and sometimes temporarily lost, themselves in their tour of the building, encompassing everything from the oil-fired boiler in the basement to the records department on the third floor, the culmination of the evening was provided by a general semi-technical lecture on "Petroleum in Cosmetics".

This lecture was informatively but informally given by T. A. Brock, F.R.I.C., A.F.Inst.Pet., the chief chemist of Max Factor & Co. Inc., who had previously served in the Analytical Laboratories at the BP Research Centre, Sunbury-on-Thames. Keeping the balance between technical content and ladies interests in an extremely competent and often amusing fashion, Mr Brock had no difficulty in holding his audience's attention. The lecture ended with a large number of questions from both members and their wives, the points under discussion including such subjects as the ravages of modern street lighting on facial cosmetics, the effect on cosmetics of extremes of climate, stains on chair covers, the importance of psychology in sales promotion, and differing brand levels of cosmetics.

As the President said in his closure of the evening, this had provided an opportunity for discussion on a subject which was an expansion into a wider field than that of pure petroleum. The lecture had been both extremely pleasurable and illuminating, and he hoped that similar evenings could be arranged at some later dates.

I.P.C. Negotiations with the Iraq Government

When the talks between the Iraq Petroleum Company and the Government of Iraq broke down recently they had been in progress at intervals for over 3 years. The discussions which led up to the ending of negotiations are described below.

The Prime Minister of Iraq announced on 11 October at the conclusion of a 5-hour meeting with the Iraq Petroleum Company negotiating team, led by H. W. Fisher, a director of Standard Oil Co. (New Jersey), that talks which had been going on intermittently since August 1958 were severed. He told the Company negotiators that he had prepared legislation which would limit the operations of the Iraq, Basrah, and Mosul Petroleum companies.

During the meeting the Prime Minister accused the companies of failing to agree to any of the demands raised by the Government during the last 3 years. This accusation was firmly rebutted by the companies' negotiators. After a great deal of discussion, the Prime Minister made what he termed a final offer. The main terms of this were that the companies should each relinquish forthwith 90 per cent of their respective concession areas, that in respect of their present producing operations the companies should grant new terms more favourable to the government than the present fifty-fifty arrangement. He also demanded that the companies in areas retained outside areas of producing operations and proven fields should enter into new arrangements which must include a share participation for the government. The companies said that these terms were impossible to accept. The Prime Minister then announced that negotiations were ended.

Following the revolution in Iraq in July 1958, Prime Minister Kassem announced that the rights of the companies in Iraq would be protected. Given this assurance the companies implemented a £100 million expansion programme designed to double the then current export capacity to 70 million tons/year from Iraq. At the same time, the government pressed for a resumption of the discussions, both on questions already raised with the companies by the previous government and on new points. Discussions have continued intermittently for over 3 years, but on no point has finality been reached, while a number of new demands have been raised by the government.

On many issues the companies have indicated to the government that they would be ready to meet the demands in an overall settlement. This would have involved substantial financial adjustments in favour of the government at considerable cost to the companies.

The main obstacle to a settlement until the beginning of this year concerned the relinquishment of a substantial part of the concessional areas of the companies. In October 1960, the government indicated verbally that it would accept a proposal for a relinquishment in three stages, spread over 12 years, of 90 per cent of the companies areas. At the next meeting the government demanded that this process should be accelerated, and the end point should be reached in two stages over 7 years. The companies accepted, in terms laid down by the government, this demand in June of this year, only to be faced in August with a demand for an immediate relinquishment of 90 per cent of their areas, which they had been banned from exploring since April of this year.

Latterly, the two most important demands of the government have been for an alteration in the proportions of profit sharing, currently 50/50, and for share participation in the companies. During discussions on these subjects in the second half of last August, the companies' negotiators repeatedly explained that they would not accept these demands. They drew the government's attention to the present state of the oil industry in the Eastern Hemisphere, where most of the markets for Iraq oil are situated, and the pressure on prices due to intense competition from Soviet oil, and other conditions. They explained that as a result the companies could not afford, even if they were willing, to make any financial adjustment to the terms of the concessions which would lead to the companies receiving a lower revenue per ton of oil exported than they were currently receiving.

To ensure that the government should be able to appreciate their position, the companies' negotiators left Baghdad at the end of August to prepare a memorandum dealing with the financial and economic problems that would inevitably face any company seeking to dispose of large quantities of oil in world markets today. The memorandum dealt with the excess capacity of the industry and the depressing effect of competition on product prices in the market. It went on to explain that this led to heavy discounts off the posted price being given to customers buying crude oil, which in its turn curtailed the ability of the large integrated companies to earn the posted price for supplies to their affiliates and still earn a return on their facilities for handling oil through the various processes involved on its way to the customer. It explained how oil industry operations were financed largely out of retained earnings, and that the major investment was needed in outlets rather than in production facilities. Because of depressed prices, however, the industry's earnings from all its operations in the Eastern Hemisphere were less than the government's 50 per cent share of the profits attributed to the production operation alone.

In ensuing negotiations the companies offered to embark on new ventures in which the government would be free to participate. This would have involved the assignment by the companies of a part of the respective areas retained by them after the first stage of the relinquishment programme, in which proven oil did not at present exist, to a new venture in which the government would be able to take a 20 per cent interest. This would have given the Iraqi government a new deal in line with concessions recently granted elsewhere in the Middle East. The government's reaction to this offer was to demand that it should cover all territories left to the companies except the producing fields. This demand moreover was coupled with the other demands mentioned above, which the companies found impossible of acceptance, particularly since their experience over the last 3 years has been that the acceptance of a demand of the government was not a step towards settlement of outstanding differences but merely a starting point for a new series of demands.

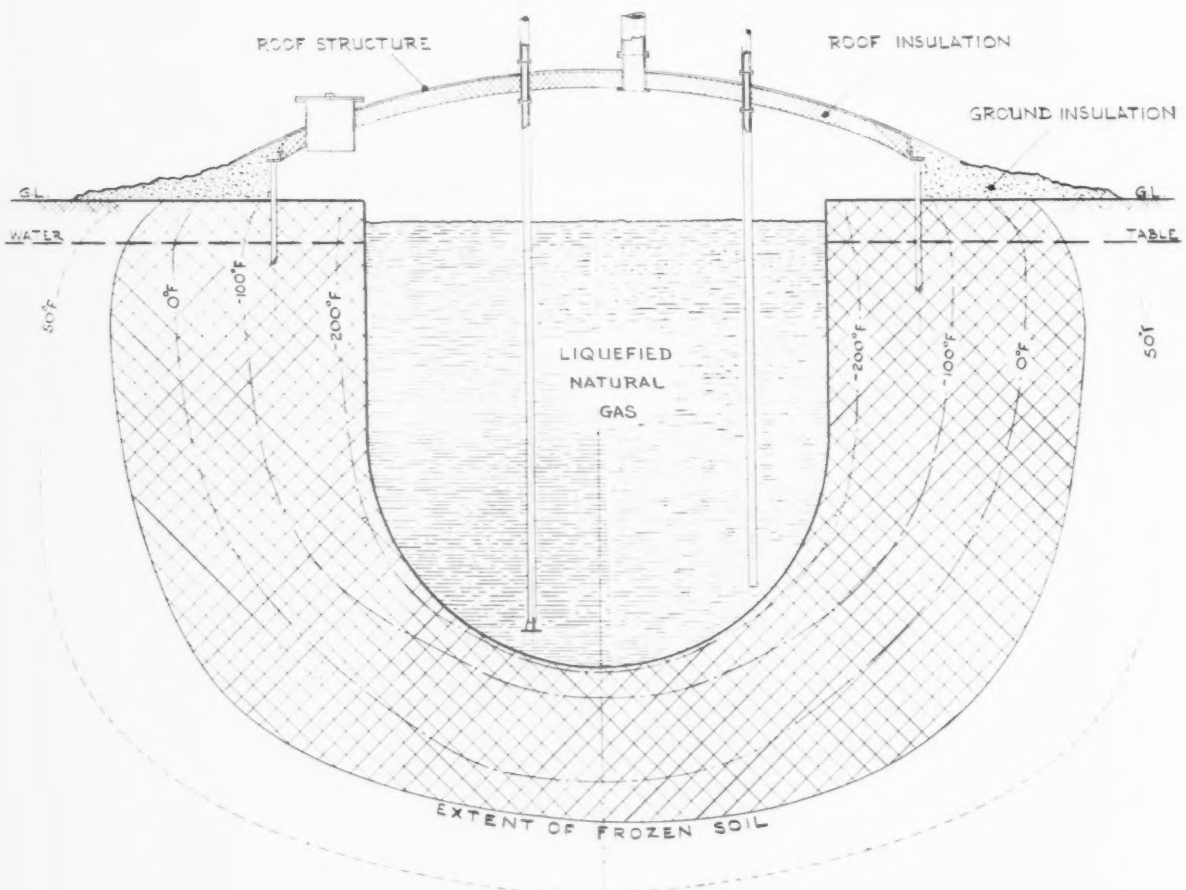
The Ground Storage of Liquefied Gases

Conch International Methane Ltd. which is owned by Continental Oil Company, Canadian Shell Ltd. and the Union Stock Yard and Transit Co. of Chicago, has recently completed in Lake Charles, Louisiana, the construction and testing of a revolutionary, but simple method of storing liquefied natural gas. In brief, the method consists of storing the liquefied natural gas at atmospheric pressure in an excavated hole in the ground covered by a suitably sealed roof. It relies on the frozen moist earth forming the walls of the hole to act as a barrier preventing loss of liquid, and to provide adequate thermal insulation. The Company has dubbed this technique "ground storage" to distinguish it from "underground storage", *i.e.* storage in caves, caverns, and depleted wells.

Following conception of the idea of ground storage by Dr Sliepcevich of Oklahoma University, preliminary tests were carried out on behalf of Conch at Shell's Thornton Research Centre in England. A hole 5 ft diameter and 5 ft deep was dug in soft sandstone containing some clay, and after pre-cooling with solid carbon-dioxide provided satisfactory storage for liquid ethylene at atmospheric pressure and −105 C without any signs of leakage. This was followed by tests on a much larger scale at Lake Charles using liquefied natural gas at atmospheric pressure and a temperature of −160 C. Parallel to these tests, a considerable amount of experimental work has been carried out on the properties of frozen soils and by means of a computer programme the heat losses from insulated and uninsulated holes were

Fig 1

General configuration of Lake Charles ground storage unit showing isotherms 3 weeks after filling



calculated. Further computer programmes are calculating the effects of latent heat.

Fig 1 shows the general configuration of the storage unit constructed and tested at Lake Charles. The hole was 20 ft diameter and 20 ft deep, and had a capacity to the fill-line of about 900 brl. The soil at Lake Charles in which the storage unit was constructed consisted of layers of silt, sand, sandy clay, and clay, and the water level was only 2 ft below the surface.

To prevent caving in during excavation, and to reduce loss of natural gas during filling, a ring of freeze pipes was sunk into the soil around the area to be excavated, and a refrigerant circulated through these pipes until the soil was frozen for 4 ft both inside and outside the circle of pipes. The surface of the earth in the area of the pipes was thermally insulated during this operation.

On completion of the soil freezing operation, the hole was excavated and a thermally insulated circular roof structure was lowered over the hole and sealed to the earth. The liquefied natural gas inlet and discharge pipes and the boil-off vent pipe were then completed and the storage unit was ready to receive its charge of liquefied natural gas.

Liquefied natural gas was charged to the storage unit to fill it within 2 ft of the top of the hole. Periodically, further liquefied natural gas was charged to the unit to make up for the boil-off which was continually measured. Three weeks after the storage unit was first filled the isotherms in the surrounding soil were as shown in the figure, and with further passage of time these isotherms gradually moved outwards. It will be noted that the thickness of frozen soil below the hole is less than that around the sides of the hole. This is due to the fact that the pre-freezing operation was confined to the sides of the hole. The effect of latent heat in the soil water is reflected in the larger gap between the 0 F isotherm and the 50 F isotherm as compared with the gap between the 0 F isotherm and the −100 F isotherm. It is clear that with this type of storage as the frozen earth barrier increases with time, the thermal insulation improves.

It is, of course, possible to line the hole with a thermally insulated material, but such thermal insulation need generally only be of a temporary type because as the volume of frozen soil increases it will provide the necessary thermal insulation. Certain tests with thermal insulation have also successfully been carried out in this Lake Charles storage unit.

No liquid losses were observed in the Lake Charles storage unit, and the rate of boil-off decreased with time to about 4 per cent (based on the contents of the storage unit) per day. With larger storage units which would have a greater volume: surface area ratio, this figure would be substantially reduced. In any case, these boil-off figures are within economic limits since the boil-off can always be used as fuel or recompressed and recycled to the liquefaction plant or sent to the gas pipeline according to whether the storage is used in connexion with a liquefaction plant or a receiving terminal. A constant check for leaks of gas through cracks that might have developed in the frozen soil or through the roof seal was made throughout the tests and not the slightest leakage was detected.

To date, liquefied natural gas has been stored in above-ground double-shell storage tanks with thermal insulation between the shells. There have also been proposals to store it in underground caverns, and the underground storage of liquefied petroleum gases is common enough. The Conch ground storage system is expected to prove cheaper than both of these earlier methods, and also has the advantage as compared with the underground storage of being much more flexible with regard to the sites where it can be installed. Conch believes that its ground storage system, which cannot rupture and is not affected by heave or other ground movements, is a satisfactory way of storing liquefied natural gas. Most types of soil examined have been found to have good mechanical properties and sufficiently good thermal insulating properties when in a frozen condition. In the case of very dry soils, it may be necessary to impregnate with water before freezing to impart sufficient strength and impermeability to the frozen soil.

View of Lake Charles ground storage unit

The Lake Charles storage unit was also successfully used to test the pumping of liquefied natural gas by means of a gas lift system, thus avoiding the use of submerged pumps.

Patents are pending on the ground storage system, the specially designed roof sealing means, and the gas lift system employed.

THE INSTITUTE'S LIBRARY

Two important works of reference have been purchased recently and are now available for consultation by members using the Institute's library and reading room. They are the *Encyclopaedia Britannica*, which will be kept in the reading room, and the *McGraw–Hill Encyclopaedia of Science and Technology*.

At the beginning of January 1962, new bookshelves and lighting, which should greatly enhance the appearance of the library and provide additional shelving for the increasing stock of books, will be fixed in the library. It will be necessary to close the library for a short period while this work is carried out, but the reading room will remain open for members visiting the Institute, and every effort will be made to maintain a reasonable service during this time.

Requests for the loan of material should, if possible, be made by letter and not by telephone between 1 December 1961 and 31 January 1962.

New Liquid-Solid Fuel Depot

Mobil fuel road tankers beside the loading gantries at the Cambridge terminal

A fuel terminal which is said by Charringtons Ltd to be "unique in Europe and the Western Hemisphere" was the scene of an open day to members of the press and general public recently.

The Cambridge terminal of Austin Beales and Co. Ltd, one of the Charringtons' Group of Companies, comprises both a fuel oil terminal and a depot handling 24 different varieties of solid fuel. Four types of Mobil fuel oil—medium, light, *Mobilheat*, and *Mobilheat V.B.* (domestic fuel oil) are sent from that Company's Coryton refinery—largely by means of an express rail tank service—and are discharged into the storage facilities at Cambridge. From there product supplies are distributed over a wide area of East Anglia.

Occupying an area of 20,000 sq yd, the terminal specializes in the speedy handling of both oil and coal supplies. To this effect, increased storage capacity and improved handling facilities have been constructed over the last year and a half, and the modernized terminal became fully operational earlier this year. Both storage and delivery facilities are still in the course of a considerable long-term expansion.

During the time that the tanks were being built, the arrangements for the alterations and extensions to the rail siding and the provision of the required electric sub-station (it was calculated something of the order of 100 kVA would be required for this extension and possible future extensions) was put in hand.

Total oil storage at Cambridge is now almost 2000 tons. The two vertical black oil tanks are lagged and fitted with heating coils, thermostatically controlled to maintain the medium fuel oil at 110°F and the light fuel oil at 60°F. The three horizontal black oil tanks are also lagged, and are fitted with immersion heaters. Dimensions of the tanks are as follows:

Medium fuel oil

1—30 ft dia × 30 ft high, of 580 tons

Light fuel oil

1—30 ft dia × 30 ft high, of 580 tons
1— 9 ft dia × 38 ft long, of 65 tons
1— 9 ft dia × 30 ft long, of 50 tons
1— 9 ft dia × 20 ft long, of 35 tons
} 730 tons

Gas oil

1—30 ft dia × 30 ft high, of 580 tons

Domestic fuel oil

1— 9 ft dia × 25 ft long, of 40 tons
1— 9 ft dia × 20 ft long, of 35 tons
} 75 tons

The rail siding can handle six 22-ton tank cars and is serviced by a twin, six station discharge header to take two grades of oil at one time, regardless of the position of the cars; the oil is taken direct in to storage via two 60 ton/hr pumps. One is a Hamworthy positive displacement screw pump with a 20 hp motor for black oils, and the other, for gas oil, is a Lee Howl centrifugal pump with a 12 hp motor. This arrangement means that it is possible to discharge six cars in approximately 1½–2 hours, dependent on the number of different grades of oil forwarded to the terminal at one time.

The road loading bay is at present fitted with 4 Emco loading arms (one for each grade of oil stored) each having pre-set loading meters and ticket printers. These arms are served by 4 centrifugal Lee Howl pumps, three of which are rated at 300 gal/min and one at 100 gal/min, the latter being for *Mobilheat V.B.* A 1500-gal tanker can be loaded in approximately 5 minutes.

The black oil lines to and from the storage tanks are electrically traced, fitted with thermostatic controls, and lagged to maintain the oil in the line at the same temperature as that in the storage tank.

The boiler is a Potterton low-pressure hot water unit, having an output of 500,000 Btu/hr, fitted with a light fuel oil burner having a firing rate of 3½ gallons/hr.

Main contractors for the new terminal were as follows:

Civil contractor	William Sindall Ltd
Tanks	McKenna Constructions Ltd
Pumps	Hamworthy Engineering Ltd
	Lee, Howl & Co. Ltd
Loading arms	Emco Brass Mfg Co. Ltd
Meters etc	Wayne Tank & Pump Co. Ltd
Pipework...	Fab-Erect Ltd.

Notes of the Month

Government Approval for Sahara Gas Imports

On 3 November the Minister of Power announced in the House that he had approved the proposals which had been submitted to him by the Gas Council for the importation of natural gas from the French Sahara, and that he was authorizing the Gas Council to go ahead with the plans.

The Minister said that he had taken into account the urgent need of the gas industry to reduce its production costs; the technical advantages of methane; the comparatively small capital cost of the scheme; and the benefit it might bring to Britain's shipbuilding. He further announced that supplies of town gas in Britain could be securely maintained, whatever might happen in North Africa, as the gas industry had placed before him alternative plans to deal with such eventualities.

Sir Henry Jones, M.B.E., chairman of the Gas Council, in announcing that the scheme would eventually lead to lower costs of gas supply in Britain, said that imports should begin in about 2½ years time. Two specially constructed tankers would convey up to 354 million therms year to a terminal at Canvey Island and that this would probably provide about one-tenth of total gas supplies, saving 400,000 tons year of oil products.

The natural gas from the Hassi R'Mel field will be piped to the gas liquefaction plant to be built at Port Arzew, near Oran. It will then be transported to Britain in a fashion similar to the cargoes carried by the *Methane Pioneer* (see *IP Review* April 1959, pages 106–113) during 1959 and 1960. After regasifying at Canvey Island the methane will be transmitted through a new main to seven Area Gas Boards in the south, Midlands, and north-west of England.

The two tankers for the transportation of the gas will each have a capacity of about 12,000 tons of liquid methane. Owing to the low specific gravity of the cargo (0·45 compared with water) their dimensions will be akin to those of a conventional 28,000-ton tanker. The vessels will be built by Vickers Ltd and Harland Wolff Ltd to the design and specifications of Conch International Methane Ltd (40 per cent Royal Dutch Shell Group, 40 per cent Continental Oil Co., and 20 per cent Union Stock Yard and Transit Co., of Chicago).

The responsibility for the transportation of the liquid methane to Britain will be that of British Methane Ltd, a company formed jointly by the Gas Council and Conch Methane. This company will charter the tankers on a long-term basis from a U.K. ship-owning subsidiary of Conch and Methane Tanker Finance Co. (Houlder Bros Ltd) respectively. British Methane have contracted with the French companies for an initial 15-year period of supply.

The exact cost in Britain of the imported methane from the Sahara is uncertain, although it has been estimated that the landed price of Saharan methane would be just under 6*d* a therm. The Gas Council say that the price of methane at present is about 8½*d* therm at Boards' works compared with the current cost of coal-produced gas of 12*d* or 13*d* a therm.

The Gas Council say the cost of the U.K. end of the project will be £7 million–£7½ million, whilst the total cost—including the building of the two vessels—will be £18 million.

Regent Refinery Planned for U.K.

Texaco Inc disclosed on 30 October that it is studying plans to build a refinery in the U.K. with a capacity of 80,000–100,000 bd to supply Regent Oil Company Ltd.

The chairman of the board of Texaco, Augustus C. Long, made the announcement in an address delivered in Boston, Massachusetts. No details are available at this time but a further announcement is expected shortly.

It will be remembered that earlier this year it was announced that plans for a Caltex refinery for Regent Oil Co. at Warsash on the east side of Southampton Water had been abandoned, and the site was being put up for sale. This project had been put forward, and land had been purchased, since 1950 but with the changing economic and oil supply positions the construction application was withdrawn in May 1959.

New Exploration Area for Shell Argentina

Under an agreement made with the Argentine State Oil concern Yacimientos Petroliferos Fiscales, Shell Production Company of Argentina is to search for and develop any commercial discovery of oil in a 20,000 sq km block located for its greater part in the provinces of Rio Negro and La Pampa, some 400 km west of Bahia Blanca.

The Company signed a previous contract with YPF in 1958, and undertook exploration of a 30,000 sq km area in the Rio Negro and Buenos Aires provinces, south of Bahía Blanca, and about 900 km south of Buenos Aires. Since then it has invested some £2¾ million in aerial, gravimetric, and seismic surveys and in drilling five shallow and two deep exploration wells without finding oil.

Under the new arrangement, the Company is exchanging 20,000 sq km of the original area for the new territory, and is to make a payment of U.S. $1,750,000 to YPF as reimbursement for its own exploration expenditure in this area, and in return will receive the results of work carried out by that concern.

Alaskan Oil Operations

Oil is rapidly becoming a major factor in the Alaskan economy. Estimates are that oil may succeed gold this year as the state's largest mineral resource.

Although there have not been any extraordinary strikes thus far, oil production is increasing steadily. Three years ago there was no oil production in the state, but during the first 5 months of 1961 it produced over 2¼ million brl.

The first discovery was made on the Kenai Peninsula in 1957, and all subsequent production has taken place in this area. Recently plans were announced for a $20 million refinery on the peninsula.

Wildcat activity is spreading across the state. Thirteen companies have geologists working along the Arctic slope at the northern extremities of the continent.

Most of the land in Alaska belongs to the Federal Government. At the beginning of this year there were over 33 million acres of Federal land on which there were 15,863 oil and gas leases.

During a competitive sale of leases last May, the state took in over $7 million from bids in the Tyonek area near Anchorage. Until this sale, Alaska had collected a total of $16 million from oil and gas resources. Alaska recently

conducted its first non-competitive oil lease sale in this same area, with first options determined by a public drawing. The state received 13,000 applications for 82 available leases. At the present time the Tyonek area contains 36 oil wells and 6 gas wells.

It was estimated recently that oil production during 1961 alone will be 6 million brl.

Two teams of geologists from BP Exploration Co. (Alaska) Inc. surveyed 60,000 sq miles of territory in the Arctic and 10,000 sq miles in mountainous country in the Alaskan Gulf last summer.

Mobile Work Barge for Abu Dhabi

A £1¼ million self-elevating mobile work platform or barge for service in the Arabian Gulf has just been launched at Swan Hunter and Wigham Richardson's shipyard at Wallsend-on-Tyne. Named the *Adma Constructor*, the platform is for Abu Dhabi Marine Areas Ltd, in which BP has a two-thirds interest, and Compagnie Française des Pétroles, one-third.

The Adma Constructor *immediately after launching from Swan Hunter and Wigham Richardson's yard at Wallsend-on-Tyne*

The *Adma Constructor*, which is 195 ft long and 90 ft wide, is basically similar in design to the drilling barge, *Adma Enterprise*, but it has a large 100-ton capacity crane instead of a drilling derrick. The barge will have four 200-ft long 8-ft diameter legs and eight 600-ton capacity de Long design hydraulic jacks for elevating the platform up to its working height of some 35 ft above sea level.

The barge will be used principally at the Umm Shaif underwater oilfield some 60 miles from the Abu Dhabi coast to erect the production towers on the well-heads, and to service the wells when production starts in 1962. The servicing of the wells will be carried out with a T-32 hydraulically driven drilling rig.

At the forward end of the barge is a three-storey deckhouse. This houses living accommodation for 16 Europeans and 36 local staff, and, on the lower deck, the workshops, while on top is a helicopter platform.

A large range of machinery is mounted inside the hull. Three 250 kW capacity generators provide electric power. There are two distillation units for producing fresh water, two air compressor units, and two 750 gal/min capacity submersible pumps to lift sea water supplies to the barge when it is raised in its operating position.

Aluminium Drill Pipe Completes 100,000 ft of Hole

The first string of aluminium drill pipe to undergo rigorous commercial tests has now drilled more than 100,000 ft of hole. The string has been in use for the past 11 months on Shell's rig No 25 in South Texas. Although it was originally designed for drilling depths up to 7500 ft, it is being used to drill holes far deeper than its rated capacity.

It was first used on the Alvin F. Sievers No 1 well in DeWitt County, Texas which reached 10,400 ft, and the hole presently being drilled will have a total depth of over 11,500 ft. When this well is completed the string will be given a thorough 100,000-ft-plus inspection.

Drilling operations have already shown that the string may be handled in the same manner as steel pipe, both on the rig and in hauling, and that conventional fishing tools and techniques may be employed without modifications. It has also been found that muds with alkaline ratings below pH11 must be used with the pipe.

The only major problem encountered so far concerned the internal geometry of the drill pipe at the tool joint. Some turbulence was created in the flow of the mud stream, resulting in a small amount of erosion on the inside of the pipe, but this problem has now been overcome.

Seven pieces of pipe which had experienced the greatest effect from the erosion problem were extracted from the Shell string, and were subjected to tensile tests by Reynolds Metals Co., developer and manufacturer of the pipe at its extrusion plant, and to fatigue tests in Reynolds and Reed Roller Bit Co.'s laboratories. The tensile test proved that the specimens retained more than 80 per cent of their original strength and were still stronger than required by normal industry standards. The fatigue tests are still under way.

BP Refinery to Supply Gas to Belfast

Homes and industry in Belfast will receive part of their gas supplies from BP's new Northern Ireland refinery soon after it comes into operation in late 1963.

An agreement has been concluded between the Belfast Corporation Gas Committee and BP which provides for an initial supply of 50 tons/day of feedstock to start shortly after the refinery comes on stream. This will be sufficient to meet between a quarter and one-third of Belfast's maximum daily gas requirements.

Belfast Corporation is to carry out a £420,000 scheme which will include building a plant to reform the gas, and then piping it into the City main. Work on this scheme will begin next year.

Actual construction work on the refinery will start early in the new year. It will have an initial capacity to process 1,300,000 tons of crude oil annually, and will involve an investment of about £8 million.

Ferrofining Unit for Llandarcy

A new unit is to be added to the lubricants plant at BP's Llandarcy refinery. This new unit will use BP's Ferrofining process, which enables lubricating oils to be manufactured without producing a solid waste by-product.

The Ferrofining unit will be the first to be constructed in the United Kingdom, and will have a throughput capacity of 3500 brl/day. The new unit will carry out the final process in the manufacture of lubricating oils, by which they are clarified and stabilized before blending, and will replace the existing clay plant.

Construction work for the new unit will start early in 1962, and is expected to be completed towards the end of that year.

Refinery Gas Reforming Plant for Granton

Following the announcement of a £1,360,000 project for the Scottish Gas Board to take gas from BP's Grangemouth refinery, it was announced recently that an Onia-Gegi self-steaming type refinery gas reforming plant is to be installed at Granton gasworks, Edinburgh. The plant, which will produce sufficient waste steam heat for process use, will comprise two units capable of reforming refinery gas to produce a maximum output of 18 million cu ft/day of 450 Btu town gas. It will also be capable of reforming butane if required. The plant, which will feature a single reactor vessel which can be modified in future for light distillate reforming, will be the first of the Onia-Gegi type to be built in Scotland. Design work has already begun, and it is expected that the plant will be completed in just over a year's time.

The £300,000 contract for design and civil engineering work for the plant has been awarded to Humphreys & Glasgow Ltd.

Refinery for Thailand

The Government of Thailand has authorized the Thai Oil Refinery Co. Ltd to supply and operate a refinery of 40,000 bd capacity on behalf of the Thai Government. The refinery will be designed to supply the entire petroleum requirements of the country.

Thai Oil Refinery Co. Ltd, a private company of Thailand, has received the support of Shell Oil Co. in its efforts to obtain government approval, and is, therefore, assured of a ready supply of crude and a market for refined products within the country. In addition to Shell, the major marketing concern in Thailand, the Company has received the backing of Caltex and Standard Vacuum, which also market petroleum products in the country.

The engineering and construction of the new refinery has been awarded to Procon Incorporated, of Des Plaines, Illinois.

Antwerp Refinery Expansion

The work of increasing output capacity at Antwerp refinery is now well under way. Progress so far includes foundation work for the 10,000 bsd distillation unit, a 9000 bsd catalytic reformer, and for a second gas oil hydrofiner of 10,000 bsd. Work is also well advanced on the construction of the new storage tanks for the refinery.

The refinery is jointly owned by BP and Petrofina, and when the current expansion programme is completed in 1962 it will give the refinery a total potential capacity of around 8 million ton/year compared with the present capacity of some 4 million ton/year.

Abadan Refinery's New Generator

A new electric generating unit, which has just gone into action at Abadan refinery's No 2 power station, has brought total generating output of the refinery up to 145,000 kW.

The power generated by the refinery's power stations supplies not only the refinery's own needs but also the oil company's residential areas, the municipalities of Abadan and Khorramshahr, while overhead wires and a transformer station near the Bahmanshir River send power across the desert at 132,000V to Ahwaz and, via another transformer, to Agha Jari and Bandar Mashur.

However, power from the hydro-electric scheme at Dez Dam is expected to become available next year, and this will supply the municipalities of Abadan, Khorramshahr, and Ahwaz. This will make additional power available to meet the needs of future developments within the refinery.

Esso to Dredge Nab Shoal

Esso Petroleum Co. Ltd is planning, subject to the necessary permission of the governmental authorities concerned, and in conjunction with the Southampton Harbour Board, to remove by dredging the present obstacles to deep-drafted ships formed by the Nab Shoal, which lies off the east coast of the Isle of Wight, and in the inner approaches to the Esso refinery at Fawley.

At present, ships proceeding to Fawley are limited to a maximum draft of 41 ft at neap tides. Since arrival draft, fully laden, of Esso's latest 77,000-dw ton tankers now under construction is 47 ft, the depth of the water over the Nab Shoal, and in sections of the Approach Channel, is at least 6 ft short of requirement.

Dredging of the channel at the Nab Shoal will not only permit tankers of 77,000-dw tons and larger to use Southampton Water fully laden, but will also put Southampton once again in the position of competing with any deep-water port in this country or Europe.

The task will involve removing more than 7 million cu yd of spoil, at an overall cost of well over £1 million, and is expected to take about 18 months to complete.

Middle East Oil Output Still Rising

Figures issued by the Petroleum Information Bureau record a further substantial rise in Middle East oil production during the first 9 months of this year.

Total output in the area rose by 8·6 per cent from 193,705,000 metric tons in the first 9 months of 1960 to 210,347,000 metric tons in the same period this year.

Details are given in the following table.

	Jan.–Sept. 1961 metric tons	*Jan.–Sept. 1960 metric tons*	*Percentage increase*
Kuwait	61,687,000	60,881,000	1·3
Saudi Arabia	50,914,000	44,277,000	15·0
Persia	43,686,000	37,393,000	16·8
Iraq	36,260,000	35,016,000	3·6
Kuwait/S.A. N.Z. ...	6,772,000	5,236,000	29·3
Qatar	6,278,000	6,154,000	2·0
Others	4,750,000	4,748,000	—
Total	210,347,000	193,705,000	

Houdriformer for Japanese Refinery

A Houdriformer unit with a nominal design capacity of 6000 bsd of petroleum naphtha has just started up at the Nippon Mining Company's refinery at Mizushima in Japan.

The unit is built on a filled-in area of the port of Mizushima. It was erected in what was, for Japan, a record time for a catalytic reforming unit by the Nissho Co. Ltd and Niigata Engineering Co. Ltd.

Engineering for the Houdriformer was handled by the Houdry and Catalytic Construction Company. It will produce a completely desulphurized 95 clear octane gasoline from Middle East crude.

BP Increases Share Capital

Resolutions to increase the authorized share capital of The British Petroleum Co. Ltd from £250 million to £300 million and to capitalize the sum of £43,560,332 from reserves by the issue of fully paid ordinary shares (one share for each £5 of ordinary stock) to those on the Register at the close of business on 15 September, 1961, were approved at the extraordinary general meeting of the Company held on 26 October 1961.

The meeting also approved an amendment to the Articles of Association increasing the permitted number of directors from twelve to sixteen.

Esso Invests More in Britain

Esso Petroleum Company's issued ordinary share capital was recently increased by £15 million to £95 million. It is understood that the capital, which was subscribed by Standard Oil Company (New Jersey), will be used to finance the Company's expansion programme.

It will be recalled that sanction was given in December 1957 to increase the authorized capital of Esso Petroleum Co. Ltd to £100 million from the previous figure of £60 million.

New Tanker will be Largest Ever Built in Europe

The largest tanker ever to be built in Europe will soon be laid down at the Eriksberg Shipyard, Goteborg, Sweden. It will be a 92,750 tonner for Mobil Tankships Ltd.

On long distance hauls carrying crude from the Persian Gulf, the new ship is expected to reduce transportation costs by over 20 per cent compared with a 48,600-ton vessel, which it replaces, previously ordered at the same shipyard.

The tanker will be the largest in the Mobil Fleet. Nine hundred feet long and 127 ft in breadth, it will have a mean draught of 47½ ft. It will include a hospital and other air-conditioned accommodation for 75 officers and men.

Propulsion will be by a single screw absorbing 28,000 shp. The average speed with a full load will be 17½ knots. It will be possible for the ship's three pumps to discharge a total cargo of 637,000 brl in 10 hr. Turn-around will be speeded by permanent ballast tanks which can be filled while cargo is discharged.

Total tank capacity of the new tanker, which will fly the British flag and be delivered early in 1964, will be 4,540,000 cu ft.

World's Largest Motor Tankers

Two 80,000-ton tankers which Shell is to charter for a period of 20 years from Sig. Bergesen d.y. will be the largest motor tankers in the world.

They will be built at Rosenberg Mek. Verksted, Stavanger, Norway, and are scheduled for delivery at the end of 1963 and 1964 respectively.

Anti-Corrosion Experiments on Tankers

Experiments to combat corrosion on the inside of oil tanker cargo tanks, particularly the underside of the deckheads, are being carried out on a number of BP tankers.

One group of experiments involves the use of various kinds of protective paints. The first ship to be treated was the 15,500-dw ton *British Kiwi*, commissioned in early 1960. This vessel had 19 tanks fully coated, seven coated on the deckheads only, and one tank left bare steel as a control. Since then a number of other new ships of the same class have been treated in varying ways, and two older ships were painted while they were out of service for a major survey.

Altogether some twenty different coatings supplied by various manufacturers are being compared on these ships, including epoxy resin based and *iso*-cyanate paints. On BP's newest tanker, the 15,000-dw ton *British Cormorant*, five different grades of surface preparation of the steel have been used before painting, and the wearing qualities of the paint on the different surfaces will be compared. The internal surfaces of this ship in all total eight acres.

It will be a year or two before the effectiveness of these protective coatings against corrosion is assessed, but the results after the first year are reported to have been encouraging, and it is understood that the insides of the tanks of all BP's new 15,000-dw ton tankers will be painted.

U.S. Natural Gas in 1960

A report published recently by the U.S. Bureau of Mines shows that marketed production of natural gas in the United States rose by 6 per cent in 1960 to 12,771,000 million cu ft.

Natural gas was consumed in 47 of the 50 states, and total consumption was 12,509,227 million cu ft, which also represented a 6 per cent increase over 1959.

Imports from Canada were 109,000 million cu ft, and with a further 47,000 million cu ft from Mexico total U.S. imports of natural gas were 156,000 million cu ft.

The average well-head value of the gas in 1960 was 14 cents per 1000 cu ft, an increase of 1·1 cents per 1000 cu ft over the previous year. Average value at points of consumption was 50·1 cents per 1000 cu ft, an increase of 2·4 cents per 1000 cu ft.

	Volume million cu ft	*No of consumers (thousands)*	*Average value cents per M cu ft*
1959			
Residential	2,912,601	30,692	101·1
Commercial	975,107	2,608	72·1
Field (drilling, pumping, etc.)	1,737,402	—	12·4
Carbon black	214,612	—	9·2
Refinery fuel	752,239	—	} 29·4
All other industrial ...	5,227,677	—	
	11,819,638		
1960			
Residential	3,103,167	31,039	103·4
Commercial	1,020,222	2,584	77·5
Field (drilling, pumping, etc.)	1,779,671	—	12·4
Carbon black	197,628	—	10·0
Refinery fuel	775,154	—	} 31·7
All other industrial ...	5,633,585	—	
	12,509,427		

Australian Oil Consumption to Double by 1970

The overall consumption of petroleum products reached 10·7 million tons in Australia in 1960, but by 1970 annual consumption may well reach 20 million tons.

This forecast was made recently by the Petroleum Information Bureau (Australia), which recalls that sales of petroleum products rose by 138 per cent in the decade to 1960. Although the Bureau considers that the same high rate of increase may not be maintained in the present decade, it foresees an expansion in consumption of almost every individual petroleum product.

The Pipeline Industries Guild

Some ninety people attended the first meeting of the 1961/62 Session of The Pipeline Industries Guild held on 10 October at Caxton Hall, London, when a lecture on "Routeing of Pipelines in England" was given by A. L. Adams of the Pipeline Division, Esso Petroleum Co. Ltd.

Mr Adams covered the procedure for establishing a pipeline route from the initial reconnaissance survey through to easement negotiations, and included the preparation of route drawings for negotiations and contract tenders.

The engineering problems involved and the difficulties encountered in securing an easement were also touched upon.

Research Laboratories at Sunbury

The first two laboratory buildings specially constructed for the Chemicals Division at the BP Research Centre, Sunbury, are now complete. The new laboratories will represent a total investment of about £500,000, and are situated on the opposite side of the road to the existing Research Centre buildings.

The No 1 Chemicals Division Laboratory building has four storeys and a total floor area of about 38,000 sq ft. It contains twenty four individual laboratories, including three in which constant temperature can be maintained. An annexe to this building houses the high pressure laboratory, which is a self-contained unit with three control rooms, six small laboratories, and a workshop.

The No 2 Chemicals Division Laboratory building is specially designed for work on pilot plants and has been built to allow for future extensions.

The Chemicals Division at Sunbury was set up in December 1958 to handle research on petroleum chemicals.

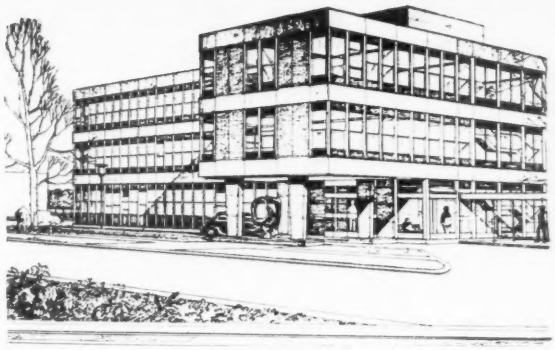
Two New Buildings at Abingdon

Site preparation has begun at the Esso Research Centre, Abingdon, Berks, for a new laboratory block to house increased petroleum chemical and polymer application research, and a three-storey office block. Both buildings will be situated in an 8-acre site adjacent to the existing laboratories site.

The laboratory block will be a single storey building having a floor area of 10,000 sq ft. It will include a large process machine hall, a chemical laboratory, a physical test room, and blending, weighing, and storage facilities for black and white products. Steam, compressed air, cooling water, and electricity will be provided, and space heating will be by a sectional hot water boiler and ventilation by a plenum system. The main structure will be a pre-fabricated steel framed unit.

The new office block will have 14,000 sq ft of floor area, and it will accommodate management staff who are at present located in London, and certain staff located in other offices at Abingdon.

The main structure will be of reinforced concrete. Heating will be by a medium pressure hot water heating system using convector radiators with thermostatic temperature control. Concealed fluorescent lighting will be used throughout.



An artist's impression of what the proposed new office building at Esso Research centre at Abingdon will look like

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NEW NAME FOR ASTM

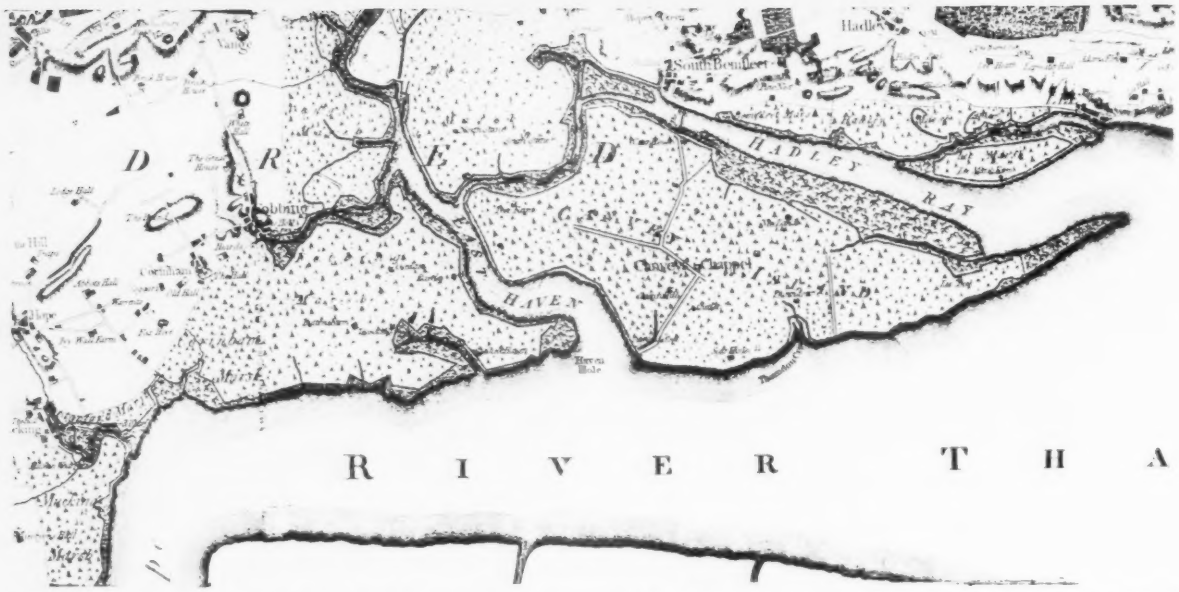
The name of the American Society for Testing Materials was officially changed to the American Society for Testing and Materials with the signing of a court decree on 18 September 1961, amending the Society's Charter, which was originally granted in 1902 by the Commonwealth of Pennsylvania.

In announcing this change, the ASTM president said, "The inclusion of the word *and* in the Society's name places added emphasis on the Society's research work in seeking knowledge of the nature of materials. It is a further re-emphasis of one of the basic purposes for which ASTM was founded in 1898. Since then, the work of the Society has been devoted to the fulfilment of its basic objectives, unchanged from the original Charter which states: 'The corporation is formed for the promotion of knowledge of the materials of engineering, and the standardization of specifications and the methods of testing'. And, to give greater stimulus to the work of the Society in the field of materials research, a Division of Materials Sciences was established two years ago."

The change in name was the result of study and discussion with members extending over several years. It was also given careful consideration by the ASTM board of directors prior to its approval and adoption by the membership at the Annual Meeting, held in June, 1961.

"Although a number of other suggestions for a new name were given serious consideration," the president said, "there was strong agreement among the membership that there should be a minimum disturbance of the name. In addition there was unanimous agreement that the initials 'ASTM' and the Society's symbol incorporating these initials, recognized throughout the world as the authority for standards for materials, should be unchanged."

ASTM now has almost 11,000 members including individuals, companies, government agencies, and educational institutions. There are in addition about 7000 prominent engineers and scientists who serve as representatives of company members on the Society's eighty-seven technical committees.



There have been many changes in the area covered by the Institute's Essex Branch since this map was published in 1777, but even to-day many of the names are familiar to members and others familiar with the area, which has an interesting history as is shown by the following article.

Branch of the Month—The Essex Branch

Thames Haven and its Development

Approximately 35 miles down river from London Bridge are Hole Haven and Shell Haven, two of the most historical of the Thames anchorages, which to-day are situated in the midst of what is possibly the heaviest concentration of petroleum refining and storage installations in Europe. They also mark the centre of the area covered by the Essex Branch of the Institute of Petroleum, which is one of the youngest branches operating under the benevolent guidance of the parent Institute.

So far as the harbours are concerned, their associations with the petroleum industry represent a relatively small portion of the time they have existed. In fact, according to one authority the first cargo was discharged at Hole Haven just over 100 years ago.

Prior to that time the harbours offered shelter for vessels waiting for suitable tides to assist them in their journey up to London. On the adjacent marshland was carried out the age-old struggle against the river to keep the land from flooding by the construction and maintenance of sea walls.

The first records show that the land was used for agriculture, and in the time of William the Conqueror it was a pasture for sheep. The sheep were valued as a source of dairy produce as much as for mutton and wool, cheese from ewes milk being recognized as a valuable form of diet.

By the 13th century the supervision of the coastal defences was being exercised by local justices and by Royal Commission, for the King was bound to provide for the safety of the realm "from the violence of that unmerciful enemy the sea" as from other enemies.

The King's jurisdiction also included the Havens or safe anchorages for shipping, and in June 1664 all goods and vessels entering the Thames were ordered to remain at Hole Haven. The reason for this was to allow the Lord Mayor of London, in his capacity as Admiral of the Thames, to search and retain vessels until satisfied that the ships and crews were free from the plague that was raging in Holland.

In the nearby Hope Reach in 1667 a squadron of the Dutch fleet anchored and blocked the Thames to land raiding parties in Canvey Island, and to bombard the Church tower at Fobbing, a landmark for shipping and a beacon in the mediaeval early warning system.

Hole Haven has also been linked by a strong tradition with the *Mayflower*, which took advantage of the free anchorage to lie there to provision before setting sail on her famous voyage.

Both the Hole and Shell Haven inlets were described as "natural shelters for barges and fishing smacks from Barking. Dutch eel boats used the anchorages as the water is less polluted than other reaches of the tideway".

By permission of the Customs authorities, the eel boats were allowed to discharge their cargoes at Hole Haven rather than taking them up river, as the foul state of the river during the summer months caused "great mortality among the eels and consequently serious loss to the owners".

By the 19th century the problem, caused by polluted water and delays in the crowded upper reaches of the Thames, of delivering perishable cargoes of fish to London gave rise to a plan for commercial development. A group of City

merchants decided to form a Company to provide safe berthing facilities at Hole Haven with a gravel road or railway to London so that perishable cargoes could be discharged and conveyed to the City. Unfortunately, the scheme did not receive sufficient support and was abandoned.

By 1835 when conditions in the river had worsened still further the scheme was revived with the formation of a Company known as the "Hole Haven and Southend Railway Co.", which proposed to build a dock at Hole Haven connected by railway to the new London and Blackwall Railway system. This scheme was abandoned within a few months in favour of another under the direction of Sir John Rennie, a famous engineer, which proposed more ambitious dock facilities on a new site just to the west of Hole Haven. The Company formed to promote the project was named the "Thameshaven Dock and Railway Co.", and thus was invented the name Thameshaven, which has become famous throughout the whole petroleum industry.

The new Company was launched in 1836 with a prospectus confidently claiming that the railway would be carrying 1 million passengers a year. The Company was greeted with enthusiasm by a public which was beginning to appreciate the benefits forthcoming from the new railways, but its early hopes were never realized. There were endless delays and stiff opposition from the local landowners, and the project finally foundered on the improvement of the London Dock system which did away with the need for the proposed construction.

The Railway Comes to Thames Haven

Nevertheless, the name given to the area lived on and when the London to Tilbury railway was opened in 1854 it was not very long before a branch line to Thames Haven was added. Other connexions soon followed, and within a few years the Thames marshland was opened up in a way which was never thought possible.

At Thames Haven an attempt was made to develop the original scheme. A wharf and some sheds were erected and a start was made on a dock, but the only business that could be attracted was a small trade in live cattle and a few passengers for Margate.

By this time Thames Haven had been described as "a purely artificial town or village consisting of little more than railway buildings and cattle enclosures brought into existence with the livestock trade". The marshes nearby and on Canvey Island had become favourite spots for bare knuckle fighting owing to the difficulty of enforcing the law in an area which was split up among different parishes. Some of the best known bare knuckle contests were held on the marshes including the classic bout between Tom Sayers and Aaron Jones on Canvey Island which was stopped by the referee after 65 rounds and called a draw as the light became so bad.

At Thames Haven the last British heavyweight championship with the knuckles was fought on 26 November 1862 between Jem Mace and Tom King for a purse of 300 sovereigns and a championship belt. Special trains for the spectators left Fenchurch Street at 6 o'clock in the morning, and tickets were on sale at two sovereigns each. After 21 rounds Mace failed to come up to the scratch and King was declared the winner.

During the first 10 years of its life, Thames Haven handled a slowly increasing trade in live cattle chiefly because of its position which spared the animals the discomfort of the up-river journey. In 1865 there was a sudden transformation in the importance of the wharves. This was due to the great cattle plague which slaughtered a large proportion of the domestic herds, and was commonly assumed to have come into the country through the cattle import trade.

Parliament was not slow in taking measures, and in 1867 an Order in Council named the only ports and wharves through which live cattle could be imported. Thames Haven was one of the four Thames import points, and its business increased to the degree that during the next 8 years its wharves handled one-third of all live cattle imported into Britain.

Early Thames Petroleum Traffic

By this time, kerosine from the Pennsylvanian oilfields was being imported into Britain, and was receiving a mixed reception. The material, though a much better illuminant than vegetable or animal oils, was very inflammable and leakages from the wooden barrels in which it made the Atlantic crossing were considered to be the causes of a number of serious fires in the Pool of London and other anchorages.

Special precautions were taken to safeguard shipping, and by the Petroleum Act of 1871 harbour authorities were required to make bye-laws regulating the traffic in petroleum. The Thames Conservators as harbour authorities in 1872 took advantage of the Act to prohibit any vessel carrying petroleum from proceeding upwards or westwards of Thames Haven, and requiring such cargoes to be discharged at buoys to be set up in the river into specially licensed craft for conveyance up river.

Shell Haven in the early 1920's. *Wooden barrels of lubricating oil at the barge jetty, having been transported by horse-drawn sledge from filling sheds*

The reason for the restriction was obvious. The river below Thames Haven was sufficiently wide to allow transshipment to take place away from the main traffic lanes, it was flanked either side by marshland and the port described as "about as inaccessible a spot as any in the three kingdoms".

Buoys were set up at various points off Leigh-on-Sea and Southend-on-Sea, and for a while all imports of petroleum were transhipped into the craft licensed by the Conservators. It was, however, a most unsatisfactory method. Ships, tugs, and steam barges were not allowed to lie alongside any petroleum-carrying vessels, the barges broke away from

Loading a fuel oil Scammell at Shell Haven East in the early 1920's. The vehicle had solid tyres and was chain driven. Note the open driving seat

their moorings, and in bad weather the small craft were placed in great danger of sinking.

The circumstances were such that suitable wharfage facilities were urgently required. In 1875, the importation of live cattle, except for immediate slaughter, was prohibited, due to foot and mouth disease, by Act of Parliament, and, since Thames Haven had scarcely any slaughtering facilities, the transformation rapidly took place.

By virtue of the 1871 Act, Thames Haven was the only riverside location outside the prohibited area with wharves, deep water alongside, storage sheds, and a railway, and it was not long before the first importations of petroleum were taking place.

Within the next 3 years, more and more petroleum was being handled at the wharves, and in July 1880 the Petroleum Storage Company was applying to the Board of Customs and Excise for the "grant of a sufferance for the handling of petroleum oil, spirit of petroleum, and other products of kindred nature". A similar application by the Company to the Commissioners of Sewers for the Fobbing Levels stresses the possibility that tanks and not warehouses were to be used.

For the next 20 years practically all imports of petroleum into the Thames, except for a certain proportion transhipped at the buoys at Southend-on-Sea, were handled by the Company, which changed its name in 1900 to London & Thames Haven Oil Wharves (1898) Ltd. Bulk shipment had become more general since the first recorded shipment in 1886 by the steamer *Petrolea*, a converted general cargo vessel, of Russian petroleum from Lipau.

In 1899 the Thames Haven Company reported that it had storage for 13,000 tons of oil products, and it was handling 50,000 tons year. There was also a reference to a refinery for the European Oil Company being built in or adjoining the Company's property.

Such activity was not limited to Thames Haven, which by 1902 had increased its storage capacity to 60,000 tons. At Purfleet 15 miles up river a 2 million gal storage installation for the Pure Oil Co. had been completed, and there was an even larger terminal covering 9 acres belonging to the Anglo-American Oil Company at the same spot.

This latter company was the one chiefly affected by the restrictions on navigation up river, and various appeals were made. It is not known whether the appeals were successful, but in 1904 the statutory limit was moved from Thames Haven to Mucking Light.

In 1905 at Thames Haven an immense cargo was shipped in less than 2 days into the 6600-dw ton oiler *Petroleum*, the delivery of which had been taken by the Admiralty as a result of its investigations into the question of providing fuel for ships at sea. Also in this year the Anglo-American Oil Company's application to discharge petroleum spirit at Purfleet instead of at Thames Haven was refused by the Thames Conservancy Board.

The question of the limit to petroleum carrying ships had by this time become a cause of continual agitation. London and Thames Haven Oil Wharves Ltd, which at that time enjoyed a virtual monopoly and was credited with handling every ton of low test petroleum into the river since early 1906, was against any alteration. A renewal of the agitation in 1908 and a complaint by the chairman of Shell that his Company was not allowed to carry bulk petroleum above Thames Haven was no more successful than previous efforts.

There was no change in the position until 1912 when the disputes existing between the oil company and the authorities over the rigorous regulations were brought into focus during the London docks strike, which caused almost an oil starvation in London. The Port of London Authority was charged with having "shown a spirit of total indifference to the subject", and later that year changes were made in the conditions governing the conveyance of petroleum in licensed craft. The capacity of vessels not possessing their own motive power was raised to 75,000 gal, and licenses were granted to specially constructed self-propelled craft. The limit for sea going tankers was held at Thames Haven.

First Plans for a Thames Refinery

In 1913 a visit by directors of the Motor Owners Petrol Committee to Thames Haven to inspect a refinery in course of erection was referred to by an oil industry journal. The refinery, which was being built on a 9-acre site leased from the London & Thames Haven Oil Wharves, would have a 3 million gal year capacity, and the high grade motor fuel product was to be offered to the trade at 1*s* 7*d* per gallon.

This is the first clear reference to a refinery on the Thames, though the first crude plant is believed to have been completed in 1908. By 1915 London & Thames Haven Co. was announcing that it had in progress the development of a fully equipped and up to date refinery for the service of its clients.

By this time the demand for petroleum, especially motor fuel, which had increased tremendously due to the first World War, was being met by the development of the cracking process first started on a commercial scale in the United States. A second refinery was under construction for the Anglo-Saxon Oil Co., later incorporated into the Shell group, on a 99-acre site at Thames Haven just within the navigable limit of the river. This site was known to be used

for the storage of petroleum in tanks of iron construction since 1912.

With the declaration of peace in 1918 and the ensuing commercial boom there was an even greater demand for petroleum. By 1921 more storage facilities had been erected at Thames Haven, a group of batch stills for the production of aromatic solvents was built at Shell Haven, and Cory Bros had acquired a 1500-acre site, which was formerly occupied by an explosives factory, at Hole Haven for the construction of an oil installation. This site, henceforth to be known as Coryton, would include public storage, wharfage accommodation, and a refinery with cross cracking processes.

Shortly before Coryton was completed the old subject of dispute, that of bringing petroleum higher up the Thames, was revived. A proposal by the P.L.A. to move the navigation limit further up-river was countered by the L.C.C. Fire Brigade on the question of fire risk. The matter simmered over the next 3 years until a fresh proposal by the P.L.A. to move the limit from Mucking Light to a point 16 miles up river brought matters to a head.

There was an immediate uproar, and the Ministry of Transport ordered a public inquiry under Major H. T. Crozier and Professor J. S. Brame, C.B.E., to be opened in December 1927. A surprising number of interested parties were involved: the Anglo-American Oil Company, The British Petroleum Co., British Tankers Ltd, and Glico Petroleum Co. were among the supporters of the change, with London & Thames Haven Oil Wharves, Anglo-Mexican Oil Co., Anglo-Saxon Petroleum, Eagle Oil & Transport, and Cory Bros prominent among the opposition.

Another photograph from the early 1920's. This one of Shell Haven jetty No 1 shows the installation pumphouse in the centre

The enquiry was conducted with great thoroughness. The assessors sat through twenty six sittings and listened to thousands of questions before it was concluded in February 1929.

A lengthy report was issued by the Ministry in July 1929, with the decision that any alteration in the existing limit to navigation for petroleum tank ships was undesirable. A resounding victory for the opposition was achieved, though the conditions covering the distribution of petroleum were eased.

Throughout the 1920's storage accommodation continued to expand. Thames Haven had tankage for 800,000 tons of product, and at nearby Shell Haven a high vacuum Steinschneider Bench plant and spirit agitators were installed in addition to the existing bitumen processing plant.

The last installation to be built before the 1939–45 war was positioned at Canvey Island. It was first proposed in 1930, and was only established by being forced through by the P.L.A. in the face of strong opposition from the local council. The question of the P.L.A.'s authority in this matter was taken to the Court of Appeal and to the House of Lords and was finally settled by the P.L.A. being granted powers to compulsorily acquire the necessary land. By mid-1936 London & Coastal Oil Wharves was formed to develop the site, and the first ship was discharged in 1937.

More Recent Developments

During October 1937, the subject of the Mucking Light limit to navigation was re-opened on the grounds that suitable underground storage could be developed at Purfleet. It was evident that the proposals had Government backing, and with little opposition the limit was quickly moved up river by July 1938. The change, however, had come too late to alter the nature of future developments. The increasing size of tankers and the areas of land required for modern refining projects confirmed the pattern of development. It saw a tremendous acceleration in the years immediately preceding the 1939–45 war which at first followed the conventional pattern of increasing accommodation at existing installations. Toward 1950 saw the unusual sight of whole refineries, bigger and more complicated than had previously been known, being built as integrated units at Shell Haven by the Shell Refining Co., and at Coryton by Mobil (then Vacuum) Oil Co.

By 1954 throughput had increased still further, and the large labour force required had led to a rapid expansion of the nearby residential areas. Other companies have since been attracted to the area including Fisons, Shell Chemicals, and many others who distribute products throughout the country.

Although the petroleum industry has been the chief industry in the area, the Essex Branch was only founded in 1956 with about 200 members. The inaugural meeting was held in January 1957 at Pitsea, and was in the form of a Brains Trust answering a wide range of questions. The panel consisted of John Carlile (D.S.I.R.), George Thornley (C. C. Wakefield Ltd), Dr J. E. Carruthers (BP), and V. Biske (Lobitos), with G. L. Kennaby (Mobil) as question master.

Since then meetings have been held every 5 weeks covering a big variety of topics. External activities entered upon by the Branch have been visits to works and other centres of interest, and an exhibition on the petroleum industry at Thurrock which was visited by over 2500 sixth form school children over the 5 days duration of the Exhibition.

COUNCIL ELECTIONS

Members are reminded that, under By-law 72, all nominations for Council Elections in 1962 must be received by the General Secretary not later than 31 December 1961.

Applications must be made on the special Council Election form, proposed by a corporate member, and supported by six corporate members. Forms are obtainable from the General Secretary.

Personal Notes

E. C. Masterson, B.Sc., F.Inst.Pet., has been appointed assistant managing director of Kuwait Oil Company in succession to **L. T. Jordan,** B.Sc., F.Inst.Pet., who has retired.

E. C. Masterson

Mr Jordan had been resident in Kuwait since transferring to the Company from Gulf Oil Corporation in 1948. He had been assistant managing director since the beginning of this year, and his retirement was marked by his appointment as an Honorary K.B.E. in recognition of his services to British interests in Kuwait.

Mr Masterson will continue to be based in London, where he has been general manager since the beginning of January 1961. He is a graduate of the Engineering School of Manchester University, and his first oil industry appointment was with Unirea S.A.R. in Rumania in 1927. His service with Kuwait Oil Company dates from 1948, when he was appointed technical assistant to Sir Philip Southwell, who was then managing director.

L. T. Jordan

Also consequent on Mr Jordan's retirement, **E. Boaden,** O.B.E., B.Sc.(Eng.), F.Inst.Pet., F.Z.S., general manager, Kuwait, since January 1961, will in future be responsible for all the Company's operations in the State of Kuwait, while **Hugh L. Scott,** who has been with the Company since his transfer from Gulf Oil Corporation in 1959, has been appointed deputy general manager.

Sir Harold E. Snow, C.B.E., M.Inst.Pet., retires as a deputy chairman and managing director of the British Petroleum Co. Ltd at the end of this year, but remains a member of the board.

Sir Harold Snow

Sir Harold, who was created a Knight Bachelor in the 1961 Birthday Honours, joined the British Petroleum Co.'s Bristol Branch in 1921, and the following year transferred to the Commercial Organization Department at head office. In 1927 he was appointed directors' assistant, and became group manager in September 1930. He continued in that capacity in Shell-Mex and B.P. Ltd on its formation in 1932, and returned to Anglo-Iranian Oil Company's Distribution Department in 1936.

From 1939 to the end of the war, he served as secretary of the Petroleum Board, and for this work he was awarded an O.B.E. He returned to the Distribution Department in 1945, and was appointed a deputy director of Anglo-Iranian Oil Co. in 1946. He was made a Commander of the British Empire in 1952, and was appointed a managing director of the Company in the same year.

Sir Harold was one of the three delegates of the International Consortium which, in 1954, negotiated the Oil Agreement with Iran.

In 1954 he resigned from the board of Anglo-Iranian Oil Co. when he became general manager of Iranian Oil Participants Ltd for the Consortium in London. He relinquished this appointment in 1955, and was re-appointed to the board of the Company, which, by then, had become The British Petroleum Co. Ltd. He was appointed a deputy chairman of BP in 1957.

Vincent N. Hurd has been appointed manager of the Gulf Eastern Co's Petrochemicals Department, in London.

Mr Hurd has been director of technical development in the petrochemicals department in Gulf's Pittsburgh headquarters. He is a graduate of Penn State University, and joined Gulf in 1942 at its research laboratory at Harmarville, Pennsylvania. He was transferred in 1951 to the general chemical staff in Pittsburgh, where he was engaged in process engineering studies on chemical subjects.

Mr Hurd is a member of the American Petroleum Institute, the American Chemical Society, and the American Institute of Mechanical Engineers.

John Morgan has been appointed manager of Mobil Oil Co.'s Midland Retail Division in succession to **V. C. Beaumont,** who has retired.

John Morgan

Mr Morgan joined Standard Vacuum in 1947 as sales representative, and progressed through various marketing positions to become retail training and merchandising manager at the headquarters of the Company in Capetown.

He returned to the United Kingdom in 1955, and became district sales manager of Western Retail Division in Bristol. In 1958 he became manager of retail sales development at Mobil's London head office.

M. H. Farmer, B.Sc., A.R.I.C., A.F.Inst.Pet., M.C., who was formerly with the Marketing Technical Division of the Esso Research and Engineering Company, has become new uses adviser to the Company.

Mr Farmer received his B.Sc. degree in chemistry at the University of London in 1944. He joined the Imperial Oil Research Department in 1952, and moved to Esso Research in 1956.

Jack Hawes, former supervisor of technology at Tidewater Oil Company's Delaware Refinery, has been promoted to superintendent of technology. He succeeds **Dr Arthur W. Lewis** who has taken up a new company assignment in Los Angeles.

Mr Hawes joined Tidewater in 1929 as an engineer in the development department at the former Bayonne Refinery.

R. Layet *E. E. Hughes* *K. C. McCarthy*

When **J. A. V. Watson, L. G. Packham, C. E. R. Millidge,** and **A. A. Baar** assume their positions as assistant managing directors of Castrol Ltd at the beginning of January 1962, they will be succeeded in their present positions by **K. C. McCarthy,** who becomes general manager, Castrol Division; **W. F. Phillips** and **R. Layet,** who become general managers, Overseas Division; **E. E. Hughes,** who will be appointed sales manager, Castrol Division; and **K. E. Shurey,** who will be the new group publicity manager.

W. F. Phillips

K. E. Shurey

Other Castrol appointments which will take effect on 1 January concern **W. F. Freestone,** who will be made manager, Overseas Division; **C. E. Parsons,** who will assume the duties of manager, Overseas Marine Department; and **J. C. Edmunds,** who will become assistant group publicity manager.

Michael L. Haider, who has been elected an executive vice-president and a member of the executive committee of the Standard Oil Company (New Jersey), was already a vice-president and director of the company, and remains on the Jersey Standard board with responsibility as a contact director for the company affiliates and activities in Latin America.

Mr Haider joined the Carter Oil Company in 1929, two years after receiving a degree in chemical engineering from Stanford University. His more recent appointments have included vice-president of Imperial Oil Ltd, deputy co-ordinator of Jersey Standard's international producing activities, and president of the International Petroleum Co. Ltd.

Dr G. G. Macfarlane, at present deputy director of the National Physical Laboratory, has been appointed director of the Royal Radar Establishment at Malvern, and will take up his new duties in the early part of 1962.

H. E. Styles, B.Sc., F.R.I.C., F.S.S., F. Inst. Pet., has been appointed London Transport's Director of Research in succession to **A. T. Wilford,** who retired recently, and **A. G. Collings,** B.Sc., F.R.I.C., has been appointed Assistant Director of Research.

Mr Styles joined the staff of the London General Omnibus Company laboratory in 1927, after graduating from Battersea Polytechnic with first class honours in chemistry. In 1940 he became assistant to the Chief Chemist, and, later, assistant to the Superintendant of Laboratories. He was appointed Superintendent of Laboratories in 1950, and was closely concerned with the design of the new Research Laboratory at Chiswick.

Mr Collings, who was educated at the Stationers' Company's School and at Birkbeck College, London, gained his early experience in the laboratory of the Government Chemist, and joined the LPTB in 1935 as an assistant chemist. He became a senior executive assistant in 1950 and a principal scientific assistant in 1951. In July 1960 he was made Assistant Superintendent of Laboratories (Chemist).

REDUCED SUBSCRIPTIONS FOR RETIRED MEMBERS

The Council of the Institute has been giving some thought to the possibility of introducing a special scheme for retired members to continue their membership at a reduced annual subscription, provided they have been associated with the Institute for a considerable period of time and have retired from a full-time position in the industry.

A scheme has now been approved and will come into force from 1 January 1962.

Any member of the Institute of Petroleum may apply to the General Secretary to continue his membership of the Institute at an annual subscription of £1 1*s* 0*d* per annum, whilst continuing to receive all the rights and privileges of full membership, providing the following conditions are fulfilled:—

(*a*) The member must have retired from full employment in the industry.

(*b*) The member must be 65 years of age and have been a member of the Institute of Petroleum for a period of not less than 20 years.

Hector D. Walker, M.I.Mech.E., M.Inst.Pet., who retired from the board of Constructors John Brown Ltd recently, is continuing his association with the company as a consultant and as a director of subsidiary companies, Automatic Control Engineering Ltd and Corrosion and Welding Engineering Ltd.

H. D. Walker

CORRECTION

The names of E. J. Robinson and R. F. N. Otway, who have been appointed a director and manager—Europe, respectively of The Head Wrightson Export Co. Ltd, appeared under the wrong photographs in the November *IP Review*. Of the two photographs which appeared at the foot of page 354, Mr Robinson's was on the right hand side and Mr Otway's on the left, and not in the reverse order as stated.

Lectures, Courses, and Conferences

Institution of Mining and Metallurgy

The two papers to be submitted for discussion at a general meeting of The Institution of Mining and Metallurgy on 21 December are "Dependence of the Floatability of Antimonite on the Value of Zeta-Potential" by Professor B. V. Derjaguin, of the Institute of Physical Chemistry, Moscow, and Mrs N. D. Shukakidse, Mag.Sc., head of Laboratorium of Caucasian Institute of Mineral Resources, and "Radon Determination as a Prospecting Technique" by Dr J. D. Peacock and R. Williamson, both of the Geological Survey of Great Britain, Atomic Energy Division.

The papers, having already been published previously by the Institution, will not be read, but will be introduced by the authors or their deputies.

The meeting will be held at the Geological Society, Burlington House, London, W.1, at 5 p.m.

Vacuum Science and Technology

The Institute of Physics and The Physical Society is holding a symposium on "Some Aspects of Vacuum Science and Technology", at Imperial College of Science and Technology, London, on 5 January, 1962. It will deal with continuously exhausted bakeable vacuum apparatus for pressures below 10^{-9} mm of mercury, and the controlled deposition of evaporated film.

Further details are available from the Administration Assistant, The Institute of Physics and The Physical Society, 47 Belgrave Square, London, S.W.1.

Feigl Anniversary Symposium 1962

The Midlands Section of the Society for Analytical Chemistry is holding an International Symposium on Analytical Chemistry at Birmingham University from 9–13 April 1962. A half-day conference on the last morning will deal with the "Teaching of Analytical Chemistry".

Plenary lectures will be given during the symposium by Professor R. Belcher (U.K.); Professor Dr Ing. F. Feigl (Brazil), whose 70th birthday the symposium will commemorate; and Professor P. W. West (U.S.A.). At least thirty-three lecturers from ten countries are expected to make contributions.

Application forms and further information are available from the honorary symposium secretary, M. L. Richardson, A.R.I.C., A.C.T.(Birm.), c o John & E. Sturge Ltd, Lifford Chemical Works, Lifford Lane, Kings Norton, Birmingham, 30.

The Physics of Semi-Conductors

An International Conference on The Physics of Semiconductors is to be held at the University of Exeter from 16–20 July 1962. It is being organized under the auspices of the International Union of Pure and Applied Physics and The British National Committee for Pure and Applied Physics of The Royal Society by the Institute of Physics and The Physical Society.

Further information may be obtained from the Administration Assistant, The Institute of Physics and The Physical Society, 47 Belgrave Square, London, S.W.1.

Perkin Centenary Trust Awards

The Perkin Centenary Trust, which was established to commemorate the centenary of the discovery, by William Henry Perkin in 1856, of mauveine, the first important synthetic dye, is inviting applications for the Perkin Centenary Fellowship, which is offered for 1 or 2 years for the purpose of higher study of any subject approved by the Trustees. Candidates must have had experience in an industrial firm or other institution concerned in the manufacture or the application of colouring matters, or they must show that their intended field of study has a direct bearing on these subjects. The value of the Fellowship is £750 year, with an additional grant of up to £100 per annum. It may be tenable, from October 1962, at any university college, or other institution approved by the Trustees.

The Trust is also offering two Centenary Scholarships, each for 2 years, renewable at the discretion of the Trustees for 1 further year, to enable candidates employed in an industrial firm or other institution concerned with the manufacture or the application of colouring matters to receive an education at a university or technical college. Each award will have a value of £350 year, which may be increased to £400 year if the candidate appointed is required to live away from home. The successful candidates may receive the whole or part of normal salaries from their employers during tenure of the scholarships.

Enquiries should be addressed to The Secretary, The Perkin Centenary Trust, c o The Chemical Society, Burlington House, London, W.1.

International Symposium on Combustion

The Ninth International Symposium on Combustion is to be held at Cornell University, Ithaca, New York, from 27 to 31 August 1962 under the auspices of the American Combustion Institute.

Among subjects which will be covered are: fundamental flame processes, detonations, modelling techniques, chemical reactions and phase changes in supersonic flow, and reciprocating engine combustion research.

Contributed papers are invited, and 800–1000-word abstracts should be submitted not later than 1 February 1962 to The Combustion Institute, 936-B Union Trust Building, Pittsburgh 19, Pennsylvania, U.S.A.

Sixth World Power Conference

Among twenty-two papers to be presented by the British National Committee at the Sixth World Power Conference, which will be held in Melbourne from 20–26 October 1962, are the following:—

"Factors which Control the Assessment of World Resources of Oil and Natural Gas" by Vincent C. Illing, F.R.S., M.A., F.G.S, M.I.M.M., F.Inst.Pet.

"The Trends in the Production and Utilization of Fuel and Power in the United Kingdom" by Chief Scientist's Division, Ministry of Power.

"A Forecast of Energy Demands in the United Kingdom for the next Ten Years" by A. Parker, C.B.E., D.Sc., F.R.I.C., M.I.Chem.E.

"Developments in British Coal Mining" by H. E. Collins, C.B.E., M.Eng., M.I.Min.E., A.M.I.E.E.,

"The Economics of Oil Supplies to the Power Industries" by P. H. Frankel, Ph.D., F.Inst.Pet., M.Inst.F., and W. L. Newton, B.A., A.F.Inst.Pet.

"Oil and Natural Gas—A Comparison of Prospects" by P. T. Cox, M.B.E., M.A., F.G.S., M.Inst.Pet.

"Production of Town Gas from Oil and Hydrocarbon Gases" by J. E. Davis, O.B.E., F.R.I.C., M.I.Gas.E., F.Inst.F.

"The Trend of Energy Requirements in the U.K. Iron and Steel Industry" by F. H. Saniter, O.B.E., B.Eng.

"Factors Affecting the Future Pattern of the World Energy Market" by M. G. Graham, M.A.

Copies of the general programme, together with membership and other application forms and information about post-conference tours in Australia and New Zealand, will be available towards the end of 1961 from the British National Committee of the World Power Conference, 201–2 Grand Buildings, Trafalgar Square, London, W.C.2.

World Assembly to Promote Economic Growth

A two-week World Economic Progress Assembly and Exposition is to be held in Chicago from 10–25 November 1962. Its aim is to promote public understanding and support for faster economic growth in both industrial and developing countries.

The subjects to be dealt with will cover a broad field ranging from banking to science and technology. Governments, international agencies, voluntary national associations, and various other institutions are expected to take part.

The gathering is to be held in Chicago's McCormick Place, which will provide 320,000 sq ft of display space for exhibitors at the Exposition, a 5000-seat auditorium for the assembly, as well as a 500-seat hall and 23 smaller meetings rooms.

Descriptive literature relating to the twin events is available from the Center for International Economic Growth, 1720 Rhode Island Avenue NW, Washington 6, D.C., U.S.A.

Creep and Fracture

An International Conference on Creep and Fracture, organized jointly by the American Society of Mechanical Engineers, The Institution of Mechanical Engineers, and the American Society for Testing Materials, is to be held in New York from 25–28 August 1963 and in London during October 1963. It will be devoted to the mechanical properties of engineering materials at elevated temperatures, and the emphasis will be on the utilization by the mechanical engineer of creep and fracture data on current materials in the design of equipment used at elevated temperatures.

Suggestions for papers are invited. Those emanating from the United Kingdom; Africa; Asia, excluding Japan; and Europe, with the exception of the U.S.S.R., should be addressed to The Secretary, The Institution of Mechanical Engineers, 1 Birdcage Walk, Westminster, London, S.W.1.

MIDDLE EAST OIL PRODUCTION

The Kuwait Oil Co. Ltd's production during the first 9 months of the year averaged 1,645,657 bd.

	September	*Jan.–Sept.*
	Tons	
Iraq Petroleum Co. Ltd ...	3,060,102	27,338,905
Basrah Petroleum Co. Ltd ...	951,406	7,244,374
Mosul Petroleum Co. Ltd ...	102,636	955,244
Qatar Petroleum Co. Ltd ...	706,850	6,179,058
Iraanse Aardolie Exploratie en Productie Mij	4,531,000	42,531,000
	Barrels	
Arabian American Oil Co. ...	44,050,172	380,430,587
Bahrain Petroleum Co. Ltd ...	1,350,652	12,326,533
Getty Oil Co. and American Independent Oil Co. (Kuwait-Saudi Arabia Neutral Zone)...	4,984,927	42,281,867

The refinery throughput at Abadan of the Iraanse Aardolie Raffinage Mij for September was 1,312,000 tons, the total for 1 January to 30 September being 10,633,000 tons.

Crude processed at Aramco's Ras Tanura refinery during September was 7,125,819 brl, the total for 1 January to 30 September being 67,166,556 brl.

J. M. Storey, C.B.E., chairman of the CBMPE, proposing the toast of The Guests. Kenneth Horne, who was Guest of Honour, is in the foreground

A Record Attendance at this Year's CBMPE Dinner

A record number of members and guests attended this year's annual dinner of the Council of British Manufacturers of Petroleum Equipment on 4 October. The Great Room of Grosvenor House made a majestic setting for this impressive social occasion at which over 1500 people were present.

The Council's principal guest was Kenneth Horne, and among the official guests were ambassadors, ministers, and attachés representing many foreign countries, and commissioners and agents-general from British Commonwealth nations.

The speech of welcome to the guests was made by the Council's chairman, J. M. Storey, C.B.E. He began by recalling that both the industry and the Council were in the same state of health as last year, and then went on to discuss some of the important events which would be occurring in the coming year.

He said that in the early part of 1962 the Council would be moving to new headquarters at 118 Southwark Street, London, S.E.1. The move was made necessary by plans for site development, but the new office would have double the present office area.

Another event referred to by Mr Storey was the Second Chemical and Petroleum Engineering Exhibition, which is to be held at Olympia from 20–30 June 1962.

"During the course of the Exhibition, the Institute of Chemical Engineers and the Society of Chemical Industry will be holding a series of symposia as part of the Third Congress of European Federation of Chemical Engineering, which will be followed and completed by a symposium organized by the Imperial College of Science and Technology.

"In addition, the Federation of European Petroleum Equipment Manufacturers will be holding the Fourth European Congress at Church House, Westminster, so that the petroleum equipment side of the industry will also be featured internationally".

The reply on behalf of the guests was made by Kenneth Horne, who, in a witty and entertaining speech, expressed the pleasure and gratitude felt by himself and his fellow guests for the privilege of being present at such an enjoyable gathering.

BULK OIL QUANTITIES

Weights in air and in vacuo

Incorrect practices in using their Petroleum Measurement Tables (ISO Recommendation R 91) for computing bulk quantities of petroleum and its products in international trade have been observed by the American Society for Testing Materials and the Institute of Petroleum. The error occurs in multiplying the quantity in litres by the density and then multiplying the resultant weight by the relationship between metric and other weight systems. The result thus computed is a weight *in vacuo* whereas by established usage, international trade is always carried out in units of weight in air.

In 1952 the American Society for Testing Materials and the Institute of Petroleum jointly issued the ASTM-IP Petroleum Measurement Tables, and in 1953 added the Metric Edition containing tables with metric units of measurement. When issuing these tables, attention was drawn to the basic problems which arise in connexion with the determination of the weights of bulk oil; and on pages xiv and xv of the Introduction to each of the three editions of the Tables a short note describes specific aspects of this problem. This note said in part:—

> "In countries using the metric system of weights, quantities of bulk oil calculated from measured volumes are often weights *in vacuo*, whereas direct commercial weighings give weights in air. At the Brussels Conference in 1949 it was decided that this discrepancy was best obviated by calculating bulk oil as weight in air. All tables which include units of weight have been calculated on this basis and for these calculations the density of standard air was taken as 0·00122 g ml at 15 C, and that of brass as 8·1 g ml at 0 C. However, for the convenience of those who are required to report metric weights *in vacuo*, the Introduction to each table containing weights in the volume of metric tables also contains a short table of appropriate conversion factors."

Many instances have been observed in international petroleum trade where the distinction between weights *in vacuo* and weights in air has not been observed. In international trade originating in countries where the metric system is in use, the original calculations give metric weights, which are in fact frequently weights *in vacuo*. At a subsequent stage of the transaction, British or American units, particularly long tons for weights aboard ships, are required; these are obtained by using factors found in Table 1 of the ASTM-IP Tables, without considering whether the starting figure is a weight *in vacuo* or a weight in air.

Multiplying the number of litres by the density gives a weight *in vacuo*. Whether or not the weight *in vacuo* is the correct system of weight in the country concerned, it must be emphasized that a weight *in vacuo* is not normally suitable for international trade; in particular long tons, unless the context specifically requires otherwise, should always be weight in air.

In the Metric Edition of the ASTM-IP Petroleum Measurement Tables, Tables 56 and 57 were supplied specifically to enable weights in air to be calculated from the measured volume and the density. Alternatively and more conveniently, the number 0·0011 may be subtracted from the corrected density (mass per unit volume at 15 C in kilogrammes per litre) to obtain a value for weight in air (again expressed as kilogrammes per litre).

This weight in air factor may now be used to obtain bulk weights in kilogrammes or metric tons in air which are then properly convertible to other units by the factors given in Table 1 of the ASTM-IP Tables.

The American Society for Testing Materials and the Institute of Petroleum wish to emphasize the above problems to everyone connected with the calculation of bulk weight of petroleum and its products, and to recommend that the density be converted to weight in air by subtracting 0·0011, and that this air density be used for computing international trade weights by factors given in Table 1: alternatively that ASTM-IP Tables 56 and 57 should be used.

Books and Films

Geological Maps of Oklahoma's Petroleum Fields

A collection of maps that will be of special interest to those concerned with the geology of Oklahoma has been published by National Petroleum Bibliography, Box 3586, Amarillo, Texas. Entitled *Geological Maps—Oklahoma Oil & Gas*, the new book is the first reference work to cover structure maps and isopachs of producing areas over the entire state. More than 500 maps, with a wealth of geological and production data, are carried in the book's 342 large pages. Each map is indexed alphabetically by field, then is listed separately in a county index.

The book represents an effort on the part of the National Petroleum Bibliography to bring together in one volume the experience of firms operating in Oklahoma as revealed in the public records of the Oil and Gas Division, Oklahoma Corporation Commission. More than 7000 hearing files, covering the period 1955–1961, were examined during its compilation.

It is hoped that the volume will serve as a starting point for oil and gas evaluation in the state and will stimulate oil and gas exploration on the basis of fresh interpretations presented in the maps. The price of the publication is $30 per copy.

Diamonds in Industry

Diamonds in Industry, recently published by the Industrial Diamond Information Bureau, is designed to meet the needs of students and engineers who require basic information about the varied uses of industrial diamonds. The booklet begins with a brief introduction on the formation of diamonds under intense heat and pressure; on the historical uses of diamonds; and on the selling organization through which they are distributed. There are also sections devoted to the extreme hardness of diamonds, and the exploitation of this property.

The booklet concludes with an account of new uses of diamonds which depend on properties other than their hardness. The semi-conducting properties of type IIb diamonds, together with a combination of other properties, make them, for example, an excellent thermistor material. Among other uses are radiation detectors in nuclear research, and as transistors in radio receivers. The booklet also records work at the Diamond Research Laboratory, where a high-voltage electron accelerator is being used to bombard diamonds with high-speed electrons in an attempt to change some of the properties.

Copies of the booklet are free from the Industrial Diamond Information Bureau, 2 Charterhouse Street, London, E.C.1. Also available from the Industrial Diamond Bureau is a folder describing fundamental and applied research on diamonds undertaken in South Africa.

A Directory of Oil Companies

Once again that invaluable compendium of information on oil companies in various parts of the world makes its annual appearance—the *Oil and Petroleum Year Book* for 1961.

In this, the fifty-second year of publication, details of some 1100 of the principal British and foreign oil companies, are contained in a section of 570 pages. Information is presented concerning the operations, finance, and directorate of each company, together with statistics of the firms' crude oil production, refinery throughput, etc.

An international buyers guide comprises over 2000 headings and entries of manufacturers and suppliers, and charts show statistics of oil consumption *per capita* in 1950 and 1960 in certain areas, together with refinery capacity over the last decade.

Copies of the 1961 edition can be obtained from the publishers, Walter E. Skinner, 20 Copthall Avenue, London, E.C.2, price 40s plus 3s postage.

"Journal of Catalysis"

The Academic Press of New York and London is to launch a *Journal of Catalysis*. It will deal with original scientific studies in heterogeneous catalysis, as well as subjects related to homogeneous catalysis.

The first issue will be published early in 1962.

The Development of Emergent Libya

The general economic development of the country of Libya is comprehensively surveyed in a new publication* which is the report of a mission organized by the International Bank for Reconstruction and Development at the request of the Government of Libya.

The mission's main task was to appraise the country's economic progress and to put forward specific recommendations for a general economic development programme to be undertaken in the next 5 years. Coincident with the writing of the report, oil had been discovered in considerable commercial quantities and the whole economic outlook of Libya was rapidly undergoing a change.

The mission proceeded in its report on the assumption that whilst oil offers a long-term prospect of establishing a prosperous economy, oil is unlikely in itself to provide employment for more than a small minority of the Libyan people. The book largely surveys the policies and programmes in the light of the occupational future for the remaining majority of the people.

The small section of the book that is devoted to oil details the oil located in Libya so far and describes the impact of the discoveries in the country and their possible industrial effect. The publication serves as an extremely useful guide to a country which has until recently been exclusively associated in the popular mind as an area of desert wasteland and little else.

**The Economic Development of Libya.* Published for the International Bank for Reconstruction and Development by The John Hopkins Press, Baltimore (London: OUP). Price 60*s* net.

Oil in the Life of Australia

The Petroleum Information Bureau (Australia) is to be congratulated on the publication of an excellent little booklet *The Oil Industry in Australia*. With an admirable economy of words, and a praiseworthy concentration on facts, the Bureau has managed to present a useful description of the Australian oil scene in sixteen well illustrated pages.

Apart from relating the history of oil operations in the Commonwealth, it also includes sections on consumption, refining, future developments, import and export patterns, distribution, petrochemicals, petroleum in the power industry, impact on economy, and the search for oil. There are also several interesting statistical tables.

The booklet can be obtained from PIB (Australia), 174 Swanton Street, Melbourne, Australia.

Shell Films Catalogue

The 1961 catalogue of *Shell Films* lists in its 145 pages some 200 films designed for showing to schools, clubs, museums, libraries, and many types of technical and cultural societies. Most of the films listed are available in both 16-mm and 35-mm versions and are available in other languages as well as English. They cover most aspects of the petroleum industry and a wide range of subjects related to the world served by oil.

The new catalogue includes 20 new films not previously listed.

Shell Films is available free of charge from Shell International Petroleum Co. Ltd, No 1 Kingsway, London, W.C.2.

British Standards

Bolting for the petroleum industry

The newly revised BS 1750, which is closely associated with BS 1506, includes a new section covering alloy steel stud-bolts and nuts for low temperature service.

It provides for four grades of bolting which are equivalent in service to the corresponding grades in the appropriate specifications issued by the American Society for Testing Materials, and includes provisions for marking which are the same as those for the comparable American bolting and are derived from ASTM data. The standard is priced at 10*s* 0*d*.

Oil resistant compressed asbestos fibre jointing

Recent experience has shown that the ignition loss test and "with grain" tensile test laid down in BS 1832 for oil resistant compressed asbestos fibre jointing are not of great value in selecting suitable jointing material. An amendment to BS 1832 (PD 1429) deletes the ignition loss and "with grain" tensile tests and adds a new stress relaxation test. Copies of this amendment are priced at 4*s* 0*d* each.

Sampling and testing of insulating refractory bricks

BS 2973 : 1961 deals with the classification, sampling, and testing of insulating refractory bricks.

The system of classification specified is based on the behaviour of the refractory material in the permanent linear change test conducted at a specified temperature. The method of determining the permanent linear change is given, there is a page on sampling, and methods of determining dimensions, warpage (which includes convexity and concavity), bulk density cold crushing strength, modulus of rupture, and thermal conductivity are also included. BS 2973 costs 6*s* 0*d*.

Equipment Developments

Road Tanker Discharges Stearine Beads in Bulk

Prices (Bromborough) Ltd has added a new vehicle which was specially constructed to carry and discharge stearine beads in bulk to its road tanker fleet.

Prices (Bromborough) Ltd's new road tanker which enables modern techniques of pneumatic handling to be applied for the first time to a wax-like solid

It has a capacity of 8 tons of beads. When discharging, the tank is tilted, and air, which is supplied to the tank car and a discharge booster from a compressor, blows the beads straight into customers' storage hoppers. Tests have shown that the beads can be vertically elevated to heights in excess of 60ft on a 3-in main.

The tanker has a length of 30ft 0in, a width of 7ft 10in, and a height of 12ft 0in. When the tank is tilted for unloading the overall height is increased to 22ft 0in.

Nylon Processing Development

A new process which makes possible the production of finished nylon parts of considerable mass from monomer rather than powders of nylon polymer has been announced by Polypenco Ltd of Welwyn Garden City. The monomer material, designated MC nylon, is a type 6 nylon formulation which exhibits physical properties spanning the range of properties obtainable in nearly all nylons in industrial use to-day.

The manufacturer claims that direct production of the finished nylon parts from monomer eliminates five steps in the processing cycle, and, unlike other nylon conversion methods, monomer casting is performed at atmospheric pressure so that the need for expensive moulds used in conventional injection or extrusion moulding of nylon polymers is eliminated. It will not compete with injection moulding, now widely used for mass production of small parts.

New Flowmeter System

A new system for utilizing a flowmeter feeding into a rate of flow and totalizing unit with an automatic print-out counter intended primarily for use on road tankers or filling stations, where it is often necessary to measure and record with a high degree of accuracy, has been developed by Meterflow Ltd of North Feltham Trading Estate, Feltham, Middlesex.

To overcome the problem of air trapped in the tanker coupling hose, the meter can be fitted with a liquid sensing probe. The probe works on the conductivity of the liquid being measured and can, therefore, be made to disregard air passing through the meter and, consequently, totalizing the liquid only.

Mechanical Shaft Seals

Crane Packing Ltd has announced a new range of mechanical shaft seals which have been designed for service at higher pressures than have so far previously been provided for by any mechanical shaft seal in standard commercial production.

The first of the range are the Crane Types 51B and 52B mechanical shaft seals. The designed nominal pressure ceiling is 1500 psig, and they are currently supplied in sizes ranging from 15 mm to 100 mm, rising by 5 mm steps.

The seals are described in Information Bulletin No 25, from Crane Packing Ltd, Slough, Bucks.

Vinyl Resins to Improve Wax Coatings

Elvax vinyl resin, a new product which is claimed to impart toughness, flexibility, and adhesion to paraffin wax and other low molecular weight materials, has been introduced to the European market by the Agricultural and Industrial Chemicals Department of Du Pont de Nemours International S.A. The new product is a multipurpose copolymer of ethylene and vinyl acetate, and is compatible in all proportions with ordinary paraffin wax. It can be used as an additive or modifier to improve wax coatings, or can be extended with paraffin wax to yield low-cost, easily applied polymer type coatings.

Pocket Sound Level Indicator

What is claimed to be the first truly pocket-sized sound level indicator has just been introduced by Dawe Instruments Ltd. Designated Type 1408D, it covers the sound level range 64–110 dB. It employs a crystal microphone and utilizes the three standard weighting curves A, B, and C to the I.E.C. specification. The instrument is fully transistorized, and is powered by a 9 volt dry battery.

A descriptive leaflet is available from the manufacturer, whose address is Harlequin Avenue, Great West Road, Brentford, Middlesex.

UOP Secondary Amines

Development quantities of a new series of secondary amines are available from Universal Oil Products Company. The five members of the new series are N-(1-methylheptyl)-ethanolamine, N,N'-bis(1-methylheptyl)-ethylenediamine, N-sec-butylanalline, Bis-(1-ethyl-3-methylpentyl)amine and N,N'-bis(1-ethyl-3-Methylpentyl) diethylene triamine.

The new amines have been named *Alkams*, and have potential uses as organic intermediates, in the preparation of unique amides, esters, fatty acid soaps, fungicides, bactericides, surface active agents, rubber chemicals, pharmaceuticals, etc.

Trade News

Low Pressure Rams

A new range of hydraulic rams designed to operate on oil at a working pressure of 2000 psi has been announced by Chamberlain Industries Ltd. Designated the BB type, there are seven bore sizes, the largest having a thrust of forty tons. Both single or double acting versions are manufactured with strokes ranging from $\frac{1}{2}$ in to 10 ft.

Aircraft Refuelling Suit

A new aircraft refuelling suit designed by a British company is now undergoing operational tests with the Italian Air Force. The suit is made in one piece and is claimed to give complete protection from aircraft fuel, gasoline, diesel oil, acids, alkalis, and paraffin. It is manufactured by Heathfield Industries Ltd of Derby.

Improved Infra-red Spectrophotometer

Perkin-Elmer Ltd has introduced an improved version of its *Infracord* spectrophotometer. The new instrument, Model 137, gives an automatic record of an infra-red spectrum from 2·5 to 15μ. The new two-speed drive preserves the standard scanning time of 12 mins but also allows fast survey spectra to be run in 3 mins. A new slit system has been incorporated to give improved resolution, especially at short wavelengths.

The instrument is described in a new brochure, available from Perkin-Elmer Ltd, Beaconsfield, Bucks.

Adjusting Domestic Oil Burners

How to Adjust Domestic Oil Burners for Maximum Efficiency is an informative pamphlet which is available free for those engaged in the installation of domestic oil burner installations, from Shandon Scientific Co. Ltd, 6 Cromwell Place, London, S.W.7.

Nitrogen and Hydrogen Plants

Technical information and flow diagrams for nitrogen and hydrogen plants designed by The Incandescent Heat Co. Ltd's Gas Atmospheres Division are given in an 8-page bulletin No V68 available from the company at Cornwall Road, Smethwick, Birmingham.

Pacific Pumps Concession for Weir

G. J. Weir of Glasgow is now manufacturing and marketing in the U.K. the range of pumps designed for the petroleum, petrochemical, and allied industries by Pacific Pumps Inc. of Los Angeles.

Stately Home's Gas Turbine Firefighting System

An impressive demonstration of the performance of one of the world's smallest and lightest gas turbine engines was given recently at Waddesdon Manor, near Aylesbury. This National Trust property houses some of the nation's most valuable art treasures, and the engine, a Perkins Mars 50 hp gas turbine, plays an important part in the firefighting system there.

Visitors to the demonstration saw how, in the event of fire, a Mars gas turbine water pump would pump water from a 250,000-gal underground reservoir situated some 300 yd from the house to fully charge a ring main at 120 psi running round three sides of the house and into the building, where it connects with a 4-in dry riser to roof level.

There is a 10-ft suction lift from the reservoir to the pump housed immediately above it. The connexion to the ring main, which is of 5-in diameter along the front of the house and 4-in diameter along two sides, is by means of a 6-in diameter pipe. The capacity of the pump is 500 gal/min at 100 psi, providing, in this instance, sufficient pressure to direct as many as nine hoses from the ground to any part of the house.

The unit is cranked by hand and reaches full speed of 40,000 rev/min in 15 sec.

Technical literature describing the Perkins Mars 50 hp gas turbine engine and its many applications, which, in addition to portable pumps, include electric generating sets, compressor sets, and instructional sets, is available from Perkins Gas Turbines Ltd, Peterborough, Northamptonshire.

U.S. Thinwall-Bellows Joints to be Manufactured in U.K.

C. A. Parsons & Company is to manufacture in the U.K., thinwall-bellows expansion joints designed by Zallea Brothers of Delaware, U.S.A. and to market them in the United Kingdom, the European Free Trade Area, and the British Commonwealth (with the exception of Canada).

Butadiene Unit for Brazil

Petroleo Brasileiro, S.A. is to construct a 29,000 metric tons/year Houdry dehydrogenation unit at its synthetic rubber complex now under construction at Duque de Caxias, near Rio de Janeiro. The plant will produce butadiene from normal butane or mixtures of butane and butenes. Feedstocks for the plant will be obtained from the new refinery at Duque de Caxias.

Microwave Instruments Ltd

Hilger & Watts announce that their company has acquired the whole of the issued share capital of Microwave Instruments. The two companies have been collaborating for over a year in the development of measuring apparatus for electron spin resonance.

Halide-Free Platinum Reforming Catalyst

The development of a new commercial halide-free platinum reforming catalyst has been announced by Houdry Process Corporation. Its use in Houdriforming units in Japan, where it is producing high yields of high octane motor gasoline, is claimed to have demonstrated that halogen is not required for successful catalytic reforming operations.

The new catalyst contains the same amount of platinum as other Houdriforming catalysts, and is said to be readily regenerated in place for restoration of activity after prolonged use.

Two New Subsidiaries for Engineering Company

Lake & Elliot Ltd, of Braintree, Essex, has formed two new subsidiary companies. Lake & Elliot Jacks and Equipment Ltd and Lake & Elliot Founders and Engineers Ltd.

Emerald Electrode

An improved *Diadem* emerald electrode for use either as a contact or free arc electrode has been produced for general purpose welding on all thicknesses of mild steel from 14 swg upwards by Cooper & Turner Ltd. It is characterized by the production of fillet welds of mitre profile, a self-releasing slag, a wide current range, a stable soft arc, and a high burn-off rate at normal currents. It is produced in a range of seven sizes from 12 gauge to $\frac{5}{16}$ in diameter.

Factory Take-over

Vernon Industries Ltd's Liverpool factory and all the manufacturing rights on the Company's aircraft ground starting and servicing equipment, high frequency alternators, convertors, etc., have been taken over by Petbow Ltd, of Sandwich, Kent.

Revised Flow Handbook

The third edition of the *Flow Meter Engineering Handbook* by Charles F. Cusick, of the American Honeywell Organization, contains 170 pages of schematic diagrams, graphs, charts, tables, and other data. There are separate chapters on steam, liquid, and gas flow calculations, each with all data necessary to calculate or check on orifice plate installation. The new edition has basic calculations re-arranged for easy reference and includes primary measuring devices other than orifice plates. Three solutions to a flow problem are outlined in each chapter: an approximation check, a nominal orifice bore calculation, and a precise orifice bore calculation. The handbook also deals with selection of primary flow elements and recommended locations. It contains a chapter on coefficients for orifice plates as well as a summary of equations, nomenclature, and conversion factors. Superheated steam factor tables have been expanded to include gauge pressures up to 3000 pounds in high pressure steam flow calculations.

The book is priced at £2 15*s* and is available from Honeywell Controls Ltd, Greenford, Middlesex.

Ethylene Glycol for Anti-Freeze

Entitled "A Word About Anti-Freeze", a new folder published by Union Carbide Ltd describes the physical properties of its grades of ethylene glycol. The folder is available from the Company's Chemical Division, 8 Grafton Street, London, W.1.

Contract for Automation Installation

A 8180,000 contract for automatic lease control systems has been awarded by Gulf Oil Corporation to Axelson Garrett Division of U.S. Industries Inc. for automatic well testing, automatic custody transfer, and punched tape data recording which will be used in a secondary recovery project for the Ramsay Block Leases, Lea County, New Mexico.

High Purity Metals

Tabulations of the general properties and methods of thirty-eight noble, rare earth, and base and rarer metals are included in new data sheets available from Johnson Matthey & Co. Ltd, 73–83 Hatton Garden, London, E.C.1.

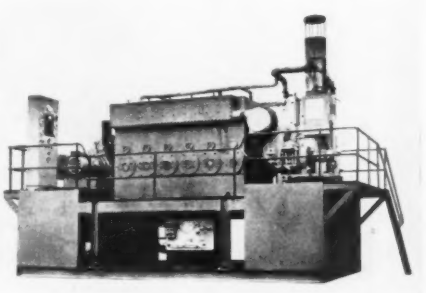
Precision Forged Self-locking Nuts

The first precision forged self-locking nuts to become available in Britain have just been introduced by Simmonds Aerocessories Ltd. The range covers all sizes from $\frac{1}{4}$ in to $\frac{1}{2}$ in diameter in Unified Fine Thread.

Descriptive leaflets are available from the Company, whose address is Treforest, Glamorgan.

Distillation Plant for Abu Dhabi

A 25,000 gal/day sea water distillation plant recently shipped by Bennis Thermoflash Ltd to the order of the Government of Abu Dhabi, is the first completely self-contained *Thermoflash* installation of its kind. It consists essentially of a *Thermoflash* distillation unit, a steam generator to provide the operating steam, and a diesel-driven alternator to provide the electric power for driving the pumps and other auxiliaries.



The photograph shows the distillation unit in the centre, with the steam generator on the right, and the diesel alternator set on the left. Below the distillation unit is an Electro-Katadyn sterilizer

Helical-Weld Aluminium Pipe

Three British companies are now offering helical-weld aluminium pipe in sizes from 6-in to 28-in diameter, with wall thicknesses of up to ¼ in. They are Apitubes Ltd, Bristol Aerojet Ltd, and the British Steel Piling Co. Ltd. The two types of aluminium tubing that were previously available in large quantities, extruded and drawn seamless tubing, were limited by practical considerations to a maximum diameter of approximately 12-in.

Magcobar Developments

Magnet Cove Barium Corporation has formed a new organization, Magcobar Division of Dresser (Germany) GmbH, to market its drilling mud projects in West Germany.

Magcobar also announced recently the start up of new processing facilities on the Island of Myconos, Greece, which will enable its finished barite weight material and bentonite to be supplied direct from that point to drilling operators in the Mediterranean area, Africa, and the Middle East.

Oil-Extended Isoprene Rubber

Shell Chemical Co. Ltd, has introduced an oil-extended version of its *Cariflex* isoprene rubber to the U.K. market known as *Cariflex* I-500. It has a high molecular weight cis 1 : 4 poly*iso*prene extended with 25 phr of a non-staining naphthenic oil.

Straight *Cariflex* isoprene rubber will now be known as *Cariflex* I-300.

Technical Brochures

Three new brochures available from Richardsons, Westgarth, & Co. Ltd, P.O. Box 2, Wallsend, Northumberland, deal with wet back shell boilers, water tube boilers, and vacuum flash evaporators.

Molten Sulphur

Advice on the handling and storage of molten sulphur and the long-distance transportation of molten sulphur is contained in a booklet just published by F. W. Berk & Co. Ltd. Delivery of sulphur in a molten state ensures a purer product and reduces the fire risk and corrosion losses.

The booklet is available from F. W. Berk & Co. Ltd, Heavy Chemical Department, Stratford, London, E.15.

Sweden's First Ethylene Oxide Plant

The Scientific Design Co. Inc is to design and engineer Sweden's first direct air oxidation ethylene oxide plant for Mo och Domsjo Aktiebolog. The 33 million lb year installation will be built at Stenungsund, site of the country's first petrochemical industry. The raw material for the new plant will be ethylene from a steam cracker now being built at Stenungsund by Svenska Esso.

Viscometer Bath

Tamson viscometer baths which can be used up to 230 C are now being marketed in the U.K. by Camlab (Glass) Ltd. Filled with water, the maximum temperature variation is as low as ±0·005 C, while with oil it is ±0·01 C. A high temperature accuracy is achieved throughout the working space by means of a wing-stirrer which causes rapid circulation of the liquid via circulation-partitions. The rate of heating is 1 C/min for water, and 1 C ½ min for oil.

The Konitest Dust Meter

The new Konitest dust meter is described in a new technical leaflet available from James Gordon & Co. Ltd, Dalston Gardens, Stanmore, Middlesex. There are three versions of the meter: Mark 1 is for applications where suitable suction is already available, Mark 2 is for the measurement of dust burden in boiler exit gases, etc., and Mark 3 is for the measurement of dust in industrial gases and atmospheres at ambient temperature.

Gland Packings

The 58-page catalogue of *Gland Packings* produced by Crane Packing Ltd is an extremely comprehensive guide to the Company's range of gland packings for any combination of service conditions. Copies of the catalogue are available from the Company offices at Slough, Buckinghamshire.

Gas Cleaning Cyclones

Head Wrightson & Co. Ltd is now offering a full range of high performance cyclone separators, which are described in a new booklet, *Gas Cleaning Cyclones*, which is available from the Company at Ship House, 20 Buckingham Gate, London, S.W.1.

Electroplating Data Sheets

The first data sheets of a revised and enlarged series describing products for the electrodeposition of silver, gold, palladium, rhodium, and platinum are available from, Johnson Matthey & Co. Ltd, 73–83 Hatton Garden, London, E.C.1.

This is one of two aromatic fractionating columns sent complete in one piece by road from the St Helens Works of William Neill & Son (St Helens) Ltd to BP's Isle of Grain Refinery. The columns are each 127 ft long, 9 ft internal diameter, and 10 ft 8 in diameter at the base end. Each tower weighs over 50 tons, and each has been tested to 200 psi

New All-British Range of Outboard Motors

The Perkins Group of Peterborough are marketing in 1962 an entirely new all-British range of outboard motors suitable for all types of craft from small dinghies to large cabin cruisers. The biggest is a 40 hp model and is the first outboard motor to be entirely styled at Peterborough. Special features are a "sealed-off" power head suspended on rubber mountings and a downward-directed silencing system.

Another new motor is the 4½ hp, which has an advantage over other small motors in that the fuel tank is not attached to the engine but is carried separately in the boat. The other engines in the new range are the 6½ hp, an improved version of the present 6 hp model, the 18 hp, developed from the 16 hp engine, and a 30 hp model.

Special attention has been paid to the styling of all these motors and much interest has already been caused in the U.S.A. They will be on view to the public for the first time at the forthcoming National Boat Show.

News from Johnson Matthey

Sample quantities of Johnson Matthey's *Nilo K* strip clad on each side with 0·5 per cent gold-antimony are now available for manufacturers of semiconductor devices. The same company reports that *Mallory 73 Beryllium* copper strip up to 0·025 in thick will in future be supplied with beryllia-free surfaces.

A data sheet is available from the manufacturer, 73–83 Hatton Garden, E.C.1.

Continuous Discharge Rotary Vacuum Filter

A new type of rotary vacuum filter known as the *EimcoBelt* filter, developed by the Eimco Corporation of America, is being manufactured by Eimco (Gt Britain) Ltd. The new filter is provided with the means for removing the filter belt from, and returning it to, the drum in the course of each revolution. The use of a scraper blade or an air blow is dispensed with, and the belt is washed before being returned to the drum, so that a clean filter medium is always in use.

Acheson Division Purchased by Cabot Carbon Ltd

Cabot Carbon Ltd of Stanlow has purchased the business and manufacturing facilities of the Dispersed Pigments Division of Acheson Industries (Europe) Ltd at Dukinfield, Cheshire. The transaction is part of a larger agreement whereby Cabot Corporation of Boston, Massachusetts, acquired the business and manufacturing facilities of the Acheson Dispersed Pigments Company of Philadelphia, and its subsidiaries and affiliates.

FOR SALE

WATERFOG and Waterspray Installations, automatic or non-automatic, designed and installed for Fire Fighting. Also complete Foam Installations. Fire Armour Limited, 9 George Street, London, W.1.

Forthcoming Meetings

THE INSTITUTE

(At 61 New Cavendish Street, London, W.1, 5.30 p.m.—tea 5 p.m.)

The Economics of Tanker Design. I. B. Blackwood, M.R.I.N.A. **3 January**

IP FAWLEY BRANCH

(At the Esso (Fawley) Recreation Club, Holbury, 5 p.m. for 5.30 p.m.)

Annual General Meeting followed by **Film Show.** **10 January**

IP LONDON BRANCH

(At Shell-Mex House)

Film Evening. **8 December**

IP NORTHERN BRANCH

(At the Old Nag's Head Hotel, Manchester, 7 p.m.)

Hot Pot Supper. **12 December**

(At the Engineers' Club, Albert Square, Manchester, 2, 6.30 p.m.)

Oil and Steel. J. A. Robertson. **16 January**

IP SOUTH-EASTERN BRANCH

(At the Sun Hotel, Chatham, 7.45 p.m.)

Annual General Meeting followed by talk **North European Pipeline.** N. W. Grey. **9 January**

IP SOUTH WALES BRANCH

(At the Training Centre, BP Refinery (Llandarcy) Ltd, 5.30 p.m.)

Management and the Place of the Chemical Engineer in the Petroleum Industry. F. Mayo, M.Sc., Ph.D. **11 January**

IP STANLOW BRANCH

(At the Lecture Theatre, Grosvenor Museum, Chester, 7.30 p.m.)

Corrosion, Detection, Interpretation, and Prevention. I. H. Thomas, B.Sc., A.I.M. **20 December**

(At Administrative Offices, Shell Refining Co. Ltd, Stanlow, 5.30 p.m.)

Annual General Meeting followed by a **Film Show.** **17 January**

IP YORKSHIRE BRANCH

(At Great Northern Hotel, Leeds, 7.30 p.m.)

Petroleum Products via Pipelines. S. Shragah and D. J. Green. **10 January**

IP ECONOMICS AND OPERATIONS GROUP

(At 61 New Cavendish Street, London, W.1, 5.30 p.m.—tea 5 p.m.)

The Petrochemical Industry in the U.K. H. P. Hodge. **14 December**

Oil and the Steel Industry. W. F. Cartwright. **11 January**

IP EXPLORATION AND PRODUCTION GROUP

(At 61 New Cavendish Street, London, W.1, 5.30 p.m.—tea 5 p.m.)

Up-to-date Techniques with Drilling Muds. P. W. Cooke. **18 January**

OIL AND COLOUR CHEMISTS' ASSOCIATION

(London Section)

(At the Royal Society of Tropical Medicine and Hygiene, Manson House, 26 Portland Place, London, W.1, 7 p.m.)

New Aspects of Corrosion. Dr J. B. Harrison. **17 January**

SOCIETY OF CHEMICAL INDUSTRY

(At the Society's Lecture Hall, 14 Belgrave Square, London, S.W.1, 2.30 p.m.)

Special Meeting on New Test Methods. *The five papers include* **The Use of a Density Column in a Storage-stability Test for Tar/Bitumen Mixtures.** Dr E. D. Tingle, N. Wright, and M. Stewart; *and* **A Test for Ease of Spreading of Bituminous Mixtures for Roads.** A. Please and R. Hardman. **14 December**

THE SOCIETY FOR ANALYTICAL CHEMISTRY

(At King's College, Strand, London, W.C.2, 11.15 a.m.)

The Application of Infra-red Spectroscopy to Problems of Analytical Chemistry. **15 December**

CHIEF DESIGN ENGINEER

A leading international engineering contracting company specialising in the design, procurement and erection of oil refinery, petrochemical and chemical plants require a Chief Design Engineer to take charge of all sections of a very large Design Office comprising Process, Mechanical, Electrical, Instrumentation and Civil Engineering Groups.

Candidates must have considerable experience in this type of work and have held a similar Executive Engineering position.

The successful applicant will be in the age group of 40–55.

Only Engineers receiving a salary of at least £4000 per annum and who are highly qualified professionally, preferably holding a Ph.D. degree, need apply. This is an exceptional opportunity for a first-class man and could lead to further promotion.

The Company operates both Staff and Higher "Top Hat" Executive Pension Schemes.

Write in confidence giving full details to Box No. 1137. *IP Review.*

Author Index

BUSBRIDGE, W. G., Industrial Uses of Radioisotopes, 357–60
COLVERD, OWEN, Pitch and Gloss, 65–7
COLVERD, OWEN, This Age of Oil, 189
CORPS, E. V., The Facts (of oil reserves) as Borne Out by Statistics, 269–72
CRANFORD, S. R., Air Pollution—Past, Present, and Future, 133–9
DREW, J. H., Esso Marine Terminal, Fawley, 252–7
FERRIN, E. E., Why Drilling is Becoming Cheaper and Faster, 309–12
FITCH, A. A., Modern Advances in Geophysics, 305–8
FOX, A. F., The Development of the South-East Kuwait Oilfields, 373–9
FRANKEL, P. H. and NEWTON, W. L., The Location of Refineries, 197–201
HOBSON, G. D., Geological Considerations (of oil reserves), 273–6
JACKSON, G. P., The Development of Bituminous Surfacings in Airfield Construction, 33–7
MUDD, G. C., Lubrication of Gears in Service, 106–9
NEEDHAM, C. E., Reactive Fuels and Chemicals from Coal, 165–71
NEWTON, W. L., See Frankel, P. H.
PIERSON, M. R., Dieselization on Southern Region of British Railways, 239–42
POWER, G. M., Development at Wilton, 1–4
RAVIOLO, V. G., Automotive Trends in a Changing Market, 349
STEPHENSON, M., The Potential of Secondary Recovery in Increasing Oil Reserves, 341–7
TOXOPEUS, E. J. G., Some Aspects of the Manufacture of Chemicals from Petroleum, 226–8

Subject Index

Abu Dhabi Marine Areas Ltd, 152
Aden:
  bulk LPG exports, 182
  refinery expansion, 154
  installation, 87
AFLAC anniversary, 120
Africa, North, concessions, 121
Alaska:
  BP Exploration, 116
  oil operations, 387
Algeria:
  exploration, 86
  Maison Carrée refinery, 87
American Association of Cost Engineers, British Group, 47
American Society for Testing Materials committee reports, 143
Ampol Petroleum Ltd, 119
Analysis, particle accelerator method, 219
Arabian American Oil Co., 1960 operations, 329
Attock Oil Co. Ltd, 119
Australia:
  energy consumption, 183, 391
  oil burners in use, 220
  oil exports, 247
  oil industry investment, 181
  refinery expansion, 117
  exploration, 86, 89–90, 116, 192, 290, 325, 361
Automobiles, trends in, 349
Aviation fuel, supersonic, 46
Bahrain Petroleum Co. Ltd, 1960 operations, 261
Belgium, Antwerp refinery, 116, 389
Berry Wiggins and Co., 149
Birch, Dr S. F., honoured by API, 321
Birmingham University Chemical Engineering Dept, 9–11
Bitumen, underwater laying, 250
Boilers, sulphur problems, 146
Bolivia, exploration, 180, 322
Books and publications:
  Achievements Book 1960, 229
  Arc Welding Electrodes, 229
  ASTM/IP tables, development of, 37
  ASTM Standards 1960, 67
  Basic Synchros and Servo Mechanisms, 91
  BCPMA report, 229
  BP Book of the Year, 123
  BP touring service, 121
  British chemicals, 121
  British Petroleum Equipment, 334
  British Standards, 59, 123, 194, 263, 334, 368, 401
  BWRA report, 162
  Canada Survey of Natural Gas, 91
  Canada Survey of Oils, 262
  Careers in Fuel, 262
  Chemistry in Europe, 121
  Coal tar fuels, 162
  Dechema monographs, 122, 401
  Diamonds in Industry, 400
  Economic Development of Libya, 401
  Export Assistance Register, 334
  First Three Years, 91
  Flammable Gases, 122
  Fuel Research 1917–58, 161
  Gas Industry in Europe, 58
  Geological Maps—Oklahoma Oil & Gas, 400
  Geology and Geophysics of Cooke and Grayson Counties, Texas, 161
  Geology of the Ouachita Mountains, 161
  Glossary of Petroleum Terms, 105, 150
  Halden (Norway) Boiling Heavy Water Reactor Project, 260
  Heat Bibliography 1959, 260
  Imperial College report, 90
  Inorganic Chemistry, 368
  International Petroleum Register, 261
  Invisible Factor, 91
  IP Instructions to Authors, 142
  IP Standards, 37
  Journal of Catalysis, 401
  Knowledge, 123
  Loading Tables for Tanker Officers, 262
  Middle East Trade, 368
  Motor Gasoline Quality, 261
  Motor trade law and practice, 122
  National Bureau of Standards publications, 262
  National Fuel and Power Policy, 58
  Nifes report, 58
  Oil and Australia 1960, 121, 401
  Oil in Britain, 91
  Oil in Latin America, 91
  Oil in the Far East, 91
  Oil in the U.S.A., 161
  Oil in Western Europe, 161
  Oil—Recent Developments in OEEC Area, 115
  Oilfields of the Commonwealth, 91
  Operators Handbook, 368
  Organic Chemical Reagents, 92
  Organic Reagents for Metals, 92
  Packaging Directory, 302
  Perspective, 161
  Petroleum Sourcebook, 260
  Picture Press, 122
  Planning for Productivity in the Oil Industry, 37
  Polyolefin Resin Processes, 262
  Post-Graduate Courses, 162
  Precision Measurement and Calculation, 122
  Production engineering practice, 193
  Qualified Men, Opportunities for, 194
  Quality Assessment of Petroleum Products, 332
  Research Highlights, 122
  Rubber products specifications, 121
  Statistical Review of Oil Industry 1960, 300–1
  Statistical Survey of Mineral Industry, 1954–9, 260
  Tanker Directory of the World, 261
  Texas Geological Highway Map, 161
  This Age of Oil, 59, 189
  Thompson Project, 229
  Transportation of Oil, 161
  U.K. Petroleum Refining Industry, 127
  Units of Weights and Measures, 260
  U.S.A. Historical Statistics of Minerals, 122
  Vapour Pressure Tables, 334
  Weights and Measures Conference, 194
  Western Australian opportunities, 368
British Petroleum Co. Ltd:
  Aden installation, 87
  African interests, 86, 361
  Alaska exploration, 116
  Angle Bay terminal, 178–9
  Belfast refinery, 117, 323, 388
  Canadian marketing, 119
  Cyrenaica concession, 86
  Dinslaken refinery, 16
  equipment purchases, 120
  government holdings, 159
  Grangemouth refinery, 389
  Greece exploration, 217
  Increased Share Capital, 390
  Isle of Grain refinery, 23, 118, 150, 182, 361
  largest tanker, 220
  Libya exploration, 154
  Llandarcy refinery, 388
  Montreal refinery, 16
  Nigeria refinery, 17
  operations in 1960, 221–3
  refinery developments, 57
  Research Centre, Sunbury, 391
  Sahara operations, 366
  Swiss loan, 155
  U.K. production and exploration, 117, 277
  U.S.A. acquisition, 153
BP Tanker Co. Ltd, 251
Brazil, Duque de Caxias refinery, 87
British Hydrocarbon Chemicals Ltd, S. Wales plant, 181
British Oil Equipment Credits Ltd, 86
British Welding Research Association, 330–2
Burmah Oil Co., U.S.A. activities, 153
Butane–air gas plant, 55
Canada:
  Montreal refinery, 16
  offshore exploration, 361
  oil and gas reserves, 228
  Port Credit refinery, 362
  refinery for Shell, 361
  refining statistics, 124
  secondary recovery, 344
Car acceleration measurement, 120
Cariflex isoprene rubber, 118
Castrol Ltd, plastics interests, 250
CBMPE activities, 364, 399
Charringtons Ltd., Cambridge Terminal, 386

Chromatography, ASTM committee, 183
Coal:
  atmospheric pollution, 133–9
  fuels and chemicals from, 165–71
Coalite process, 166
Coke, atmospheric pollution, 133–9
Corrosion, institute proposed, 100
Cosden Petroleum Corpn., 364
Cyrenaica, exploration, 86
Das Island, developments, 153
Denmark, Kalundborg refinery, 314
Diesel Exhaust Fume Abatement Society, 94
Diesels, use on British railways, 239–42
Distillers Co. Ltd, 48
Domestic heating, 219, 324
Dracone flexible barge, 119
Drilling:
  costs, 179
  why cheaper and faster, 309–12
Drilling platforms:
  Gatto Selvatico, 314
  Adma Constructor, 388
Earth Sciences Observatory, 218
ECAFE, Bangkok meeting, 194
Eire: exploration, 180
Engine tests, IP, amendments, 203
Engines, operating temperature measurement, 155
ENI activities, 57
Esso Petroleum Co. Ltd:
  butyl rubber plant, 116
  dredging of Nab Shoal, 389
  Fawley refinery, 117, 361
  Fawley terminal, 252–7
  increased share capital, 390
  Milford Haven refinery, 12–15
  operations in 1960, 193
  Tynemouth terminal, 17
  U.K. exploration, 180
Esso Research Ltd, 391
Europe, Western, oil development, 115
European Free Trade Area, origin rules, 120
Europoort, 190–1
Ferrofining process, 46
Films:
  Austrian International, 161
  BP News in Pictures, 123
  Hidden Power, 162
  Highland Fling, 161
  High-speed Flight, 122
  Hold Back the Sea, 302
  Industrial Screen awards, 365
  Iron and Steel Notebook, 122
  Living Museum, 161
  PIB 1961 Catalogue, 334
  Protecting Pipeline Against Corrosion, 262
  Safety and Solvents, 229
  Service to Industry, 162
  The Answer is Simple, 59
  The Right Line, 59
Fire Protection Association, 120
Fire fighting, new chemical for, 299
Fischer-Tropsch process, 333
France:
  crude output, 101
  Hevlisheim refinery, 87
Gambia, exploration, 86, 361
Gas industry, oil and, 54, 55, 125, 389
Gases, chemical reaction research, 48
Gasoline, "Coalene", 169
Gears, lubrication, 106–9
Geophysics:
  advances in, 305–8
  exploration vessels, 363
  seismological research, 159
Germany:
  Dinslaken refinery, 16
  refinery expansion, 362
Grange Chemicals Ltd, phthalic anhydride plant, 182, 250
Gulf Oil Corporation:
  Denmark refinery, 46
  operations, 118, 193, 364
Hedon Chemicals, vinyl acetate plant, 291
Honolulu Oil Corporation, 219
Honours, British, 45, 251
Hydrocarbons:
  analysis, particle acceleration, 219
  detected in meteorite, 155
Hydrogen, light oil raw material, 154
Imperial Chemical Industries Ltd:
  Billingham developments, 88, 117
  in European Common Market, 181
  oil distillation plant, 177
  Wilton developments, 1–4, 46, 88, 180
India:
  BOC agreement, 248
  exploration, 248
  gas turbine power station, 251
  pipelines, 77–8, 182
Information and its dissemination, 233–8
Insecticides, use in Kiewa hydro-electric scheme, 155
Institute of Petroleum:
  Annual dinner, 97–100
  awards, 204–5
  Benevolent Fund accounts, 157
  Branch of the Month:
    Essex, 392
    Fawley, 224–5
    Northern, 112–3
    Scottish, 295–8
    South-eastern, 148–50
    Stanlow, 186–8
  Branches:
    Bahrain, 313, 348
    Birmingham, 156–7, 313
    Essex, 104, 140, 379
    Fawley, 6, 283, 380
    Kuwait, 75–6
    London, 40, 68, 140, 175, 206, 282
    Northern, 38, 68, 104, 140, 174, 381
    Scottish, 6, 40, 70, 105, 176, 381
    South-Eastern, 8, 206, 282
    South Wales, 8, 38, 104, 380
    Stanlow, 5, 42, 70, 104, 140, 175, 313, 380
    Trinidad, 5, 38, 104, 278–82
    Yorkshire, 6, 140, 172, 282, 348
  Awards, 204
  Cadman Memorial Medal and Lecture, 105, 285
  Council elections, 313
  Council Members 1961–62, 202
  Economics and Operations Group, 283
  Ladies Night, 382
  Retired members' subscriptions, 205
  Summer Meeting, 233–8
International Systems Co. Ltd, 251
Iran:
  Abadan refinery, 86, 362, 389
  deepest well, 87
  exploration, 86, 87, 101, 154, 249, 290, 323
  fertilizer plant, 88
  history, 161
  IPC operations, 144–6, 177
  Kharg Island terminal, 15
  Meshed storage depot, 119
  Naftkhanah oilfield, 192
  oil exports, 86, 182
  oil statistics 1957–9, 158–9
  Pazanum oilfield, 86
  pipelines, 109, 118, 315, 324
  SIRIP drilling platform, 314
  tankers, 118
  Teheran refinery, 363
Iraq Petroleum Co. Ltd
  Negotiations with government, 383
Israel: Haifa refinery, 180
Italy:
  Cremona refinery, 182
  Mobil chemical plant, 117
Kenya refinery, 181
Kern Oil California Ltd, 153
Kern Oil Co. Ltd, 153
Kern Trinidad Oilfields Ltd, 153
Kerosine, origin of, 65–7
Kuwait:
  offshore concession, 46
  plans for 1961, 90
  pipeline, 362
  South-east oilfields, 373
Libya:
  exploration, 86, 154
  pipeline, 362
Lobitos Oilfields Ltd, Ellesmere Port refinery, 323
London, air pollution, 137–8
London–Moscow coach trip, 336
London Transport research laboratory, 79–81
Louisiana, Hollywood gas field, 248
Lubricants, transport in rubber bags, 183
Lubricating Oils, engine testing, Brighton conference, 211–4
Lubrication, gear, 106–9
Marketing, essentials of, 264
Medway Oil and Storage Co., 149
Middle East:
  oil production statistics, 4, 50, 81, 114, 143, 189, 210, 217, 263, 302, 336, 363, 368, 389, 399
  secondary recovery, 345
Middle East Association, 183
Mobil Oil Co. Ltd plastics interests, 250
Monsanto Chemicals, polyethylene plant, 117
Naftkhanah oilfield, 192
National Iranian Oil Co.:
  drilling activity, 47
  history, 161
  reorganization, 248
National Lubricating Oil & Grease Federation dinner, 24–6
Natural gas:
  ground storage, 386
  reforming plant, 218
  imports, 387
NCB briquetting process, 168
Netherlands:
  Europoort, 190–1
  ICI Rotterdam plant, 291
  offshore drilling, 322
New Zealand, Marsden Point refinery, 290
Nigeria:
  Bonny river terminal, 243
  exploration, 47
  Shell-BP refinery, 17, 154
Nitrogen fertilizer, Cherokee, Arizona, plant, 249
Northern Ireland, Belfast refinery, 117, 323
Norway, Slagen refinery, 286–9
OEEC:
  energy policy, 153
  oil consumption, 48
Oil, age of, 189
Oil Industries Club dinner, 27
Oilfield equipment, British-made, 28–30
Organic Geochemistry Group, 264
Organization of Petroleum Exporting Countries, 355–6
Pakistan, exploration, 153, 154, 180, 218
Pakistan Petroleum Ltd, 153, 154, 218
Parsfield Research Laboratories, 259
Petrochemicals:
  isoprene rubber, 118
  manufacturing aspects, 226–8
  polyisoprene plant, 87
  polypropylene plant, 88
Phenols:
  dihydric, 170
  monohydric, 171
Philippines, Tabangao refinery, 154

Pipelines:
coatings, 94
India, 77–8, 182
Iran, 109 118, 315, 324
manual transport, 49
Tapline, 78
U.K. 11, 19, 53, 125, 159, 220
Pohl, Wilfred, retirement, 160
Plastics:
Castrol interests, 250
Mobil interests, 250
Pollution:
atmospheric, 133–9, 333
crankcase leaks, 115
Power Petroleum Co., 149
Process Control:
G.E.C. interest in, 251
Production:
offshore, remote control, 116
secondary recovery potential, 341–8
underground combustion, 117
Prorationing, international oil, 355–6
Queen's Channel Terminals Ltd, 19, 43
Radioisotopes, industrial uses, 357–60
Railways, dieselization, 239–42
Refineries:
Abadan, 86, 362, 389
Aden, 154
Algeria, 87
Avon, San Francisco, 249
Antwerp, 117, 389
Australia, 117
Belfast, 117, 323, 388
Canada, 124, 361
Coryton, 47
Delaware, 291, 363
Denmark, 46, 314
Dinslaken, 16
Duque de Caxias, Brazil, 87
Ellesmere Port, 323
Fawley, 117, 361
Germany, 362
Grangemouth, 389
Haifa, 180
Herrlisheim, 87
Isle of Grain, 23, 118, 150, 182, 361
Kenya, 181
Libya, 362
Llandarcy, 388
location of, 197–201
Marsden Point, New Zealand, 290
Milford Haven, 12–15
Mizushima, 390
Montreal (BP), 16
Montreal (British American Oil Co.), 291
new projects, 201
Nigeria, 17, 154
Port Credit, Ontario, 362
Pulau Bukom, Singapore, 250
Slagen, Norway, 286–9
Spain, 217
Tabangao, 154
Teheran, 363
Thailand, 389
U.K., 127
World capacity, 200
Refining:
Ferrofining process, 46, 388
Ferrofining process, 46
UOP Lomax unit, 117
Regent Oil Co:
Cardiff terminal, 52–3
Granton terminal, 246–7
personnel, 159
U.K. refinery, 387
Research:
anaesthetics, 183
Egham combustion laboratory, 20–1
London Transport laboratory, 79–81
Passfield Laboratories, 259
Tunstall laboratory, 117
welding, 330–2
Reserves, oil:
Canada, 228
geological considerations, 273–6
secondary recovery potential, 341
statistical considerations, 269–72
U.S.A., 228
why are they growing, 269–77, 305–12, 341–8
World, 103
Rexco process, 168
Rochdale process, 168
Sahara:
BP operations, 366
effect on French crude output, 101
exploration, 116, 361
St Lawrence Seaway, 182
Secondary recovery, reserves potential, 341–8
Sell, George, retirement, 102–3, 147
Senegal, exploration, 86, 361
Shell-BP Petroleum Development Co. of Nigeria, 17
Shell Chemical Co. (U.S.A.):
polyisoprene plant, 87
polypropylene plant, 88
Shell International Petroleum Co:
Egham combustion laboratory, 20–1
Kuwait concession, 46
language teaching, 49
Shell Centre, 49
Shell Lodge, 88
Shell-Mex and B.P. Ltd, road safety award, 220
Shell Oil Co., 1960 operations, 193
Shell Production Co. of Argentina, 387
"Shell" Research Ltd:
anaesthetics research, 183
Tunstall laboratory, 117
Ships, nuclear powered, 159
Singapore, Pulau Bukom refinery, 250
Solartron Electronic Group headquarters, 324
South West Africa, exploration, 248
Spain, Ohio Oil Co. refinery, 217
Specification, diesel starter fuel, 58
Standard Oil Co. (N.J.), 118, 260
Standard-Vacuum Oil Co., 18
Stanlow, oil history, 186–7
Suez Canal, tanker traffic, 334
Syria, Karachuk production, 154
Tankers:
Alfaris, 249
anti-corrosion experiments, 390
availability, 121
B.P.'s largest, 220
British Prestige, 365
dimensional characteristics, 253
Esso Pembrokeshire, 291
Europe's largest, 390
Gulf Italian, 364
Iranian, 118
laid-up, problems of, 194
launchings, 126
mammoth, 48
nuclear propelled, 125
refrigerated, for LPG, 154
Suez Canal traffic, 334
world constructions, 128, 262
world's largest motor powered, 390
Tanks, storage, automatic welding, 51
Tapline, ten year operations, 78
Tar acids, fractionation, 170
Terminals:
Angle Bay, 178–9
Bonny River, Nigeria, 243
Cardiff, 52–3
Dundee, 181
Fawley, 252–7
Granton, 246–7
Kharg Island, 15
Queen's Channel, 19, 43
Tynemouth, 17
Terylene, 1
Tidewater Oil Co., 249, 250, 290, 291, 363
Total Oil Products (GB) Ltd, 22–3, 155, 223
Transport, lubricants in rubber bags, 183
Trinidad, Pitch Lake, 65
Trinidad Petroleum Development Co., 218
Trunk Pipelines Ltd, 19
United Kingdom:
air pollution, 133–9
bulk oil storage, 11
derv oil tax, 125
derv regulations, 48
diesel fume regulations, 177
electrical industry, 143
energy consumption, 125, 242, 298
exploration, 180
Fawley history, 224–5
filling station illumination, 125
fuel consumption, 134
fuel oil consumption, 11
fuel oil duty, 176
fuel oil price, 53
fuel policy, 125
gas industry, oil in, 54, 55, 125
gasoline on M1, 53
Hydrocarbon Oil (Marketing of Gas Oil) Regulations 1960, 261
kerosine tax yield, 220
labour in refining, 162, 365
light oil tax relief, 242
methane imports, 177, 242, 291
motor spirit retailers, 155
oil and national economy, 11, 159
oil consumption, 42, 53, 208–10, 259, 325, 367
oil duties, 177, 229, 293, 298
oil equipment orders, 50, 90, 163, 263, 335
oil imports, 50, 90, 163, 263, 335, 360
oil imports from Communist countries, 53, 177, 220
oil imports, 53, 242, 293, 298
oil industry statistics, 328–9
oil trade 1960, 72–4
pipelines, 11, 19, 53, 125, 159, 220
polypropylene plant, 46
refineries, 12–15, 23, 117, 118, 127, 150, 182, 223
shale oil industry, 242
TEL exports, 67
WD approved oils, 127, 335
U.S.A.:
Canadian gas import, 48
computer centre, 361
drilling costs, 179
natural gas sales, 390
oil and gas reserves, 228
secondary recovery, 343
wildcat discoveries, 217
United Steel Companies Ltd, 194
Universal Oil Products Co., 229
U.S.S.R., secondary recovery, 346
Varga hydrocracking process, 249
Veedol (U.K.) Ltd, 290
Venezuela, secondary recovery, 345
Warren Spring Laboratory, 333
Weather, 70
Welding, automatic, 51
Wilton, development of, 1–4, 46, 88, 180
Woodfield Rochester Ltd, 28–30
World:
bunker oil deliveries, 321
crude oil ownership, 82–3, 350–1
crude oil production, 71, 316–21
crude oil reserves, 103, 300
international oil prorationing, 355–6
oil demand, 300, 316–21
oil industry 1960, 300–1
refined products output, 316–21
tanker constructions, 128, 262
tanker fleet, 92
tanker launchings, 126
World Petroleum Congress:
Fifth, accounts, 70
Sixth, 139, 284–5, 334

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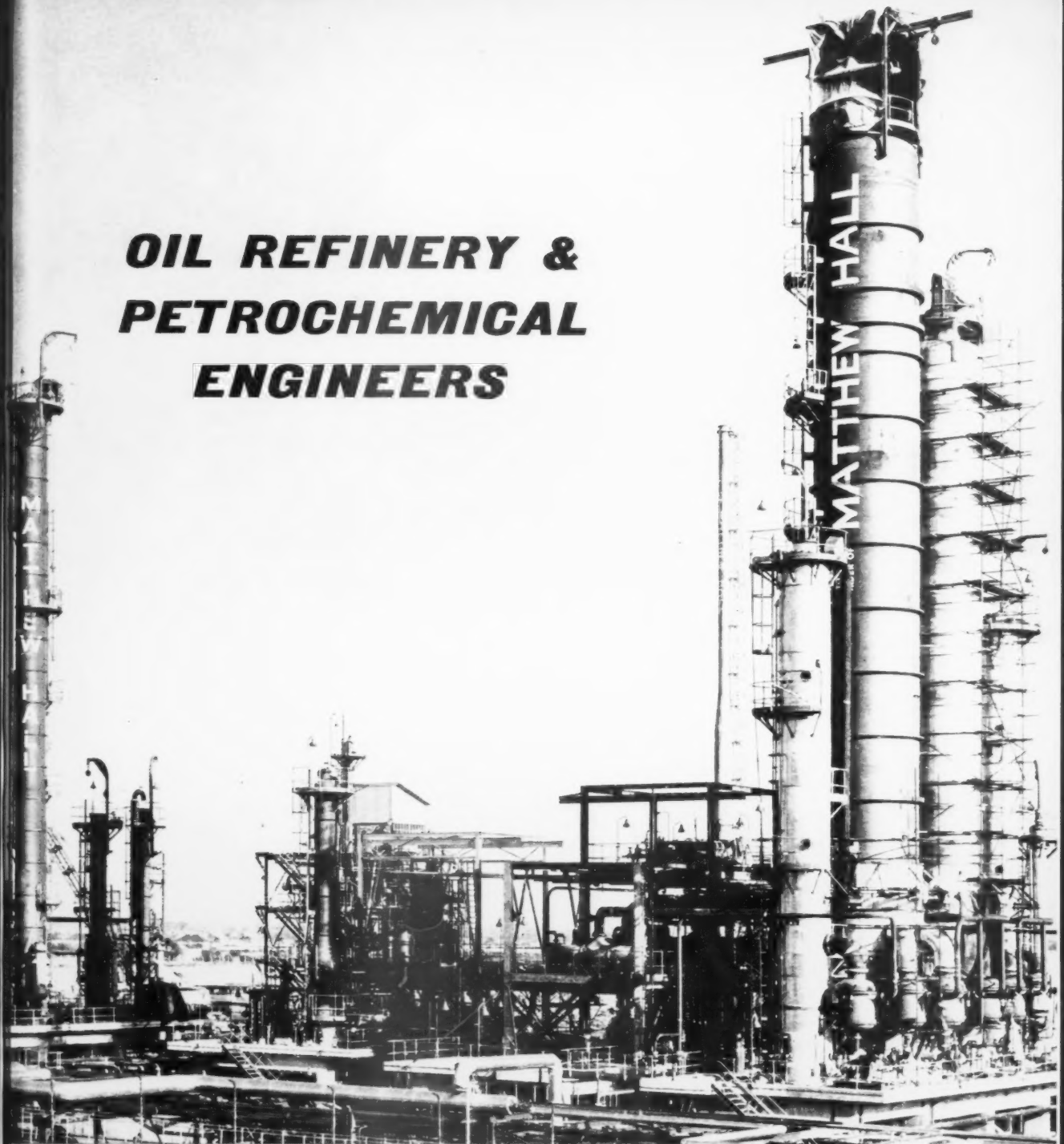

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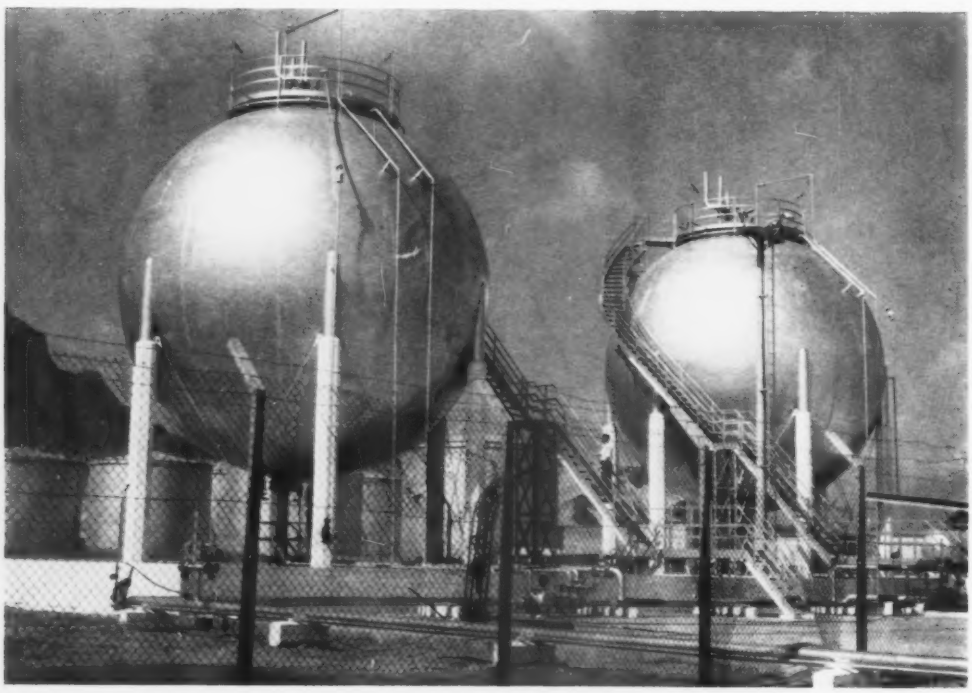

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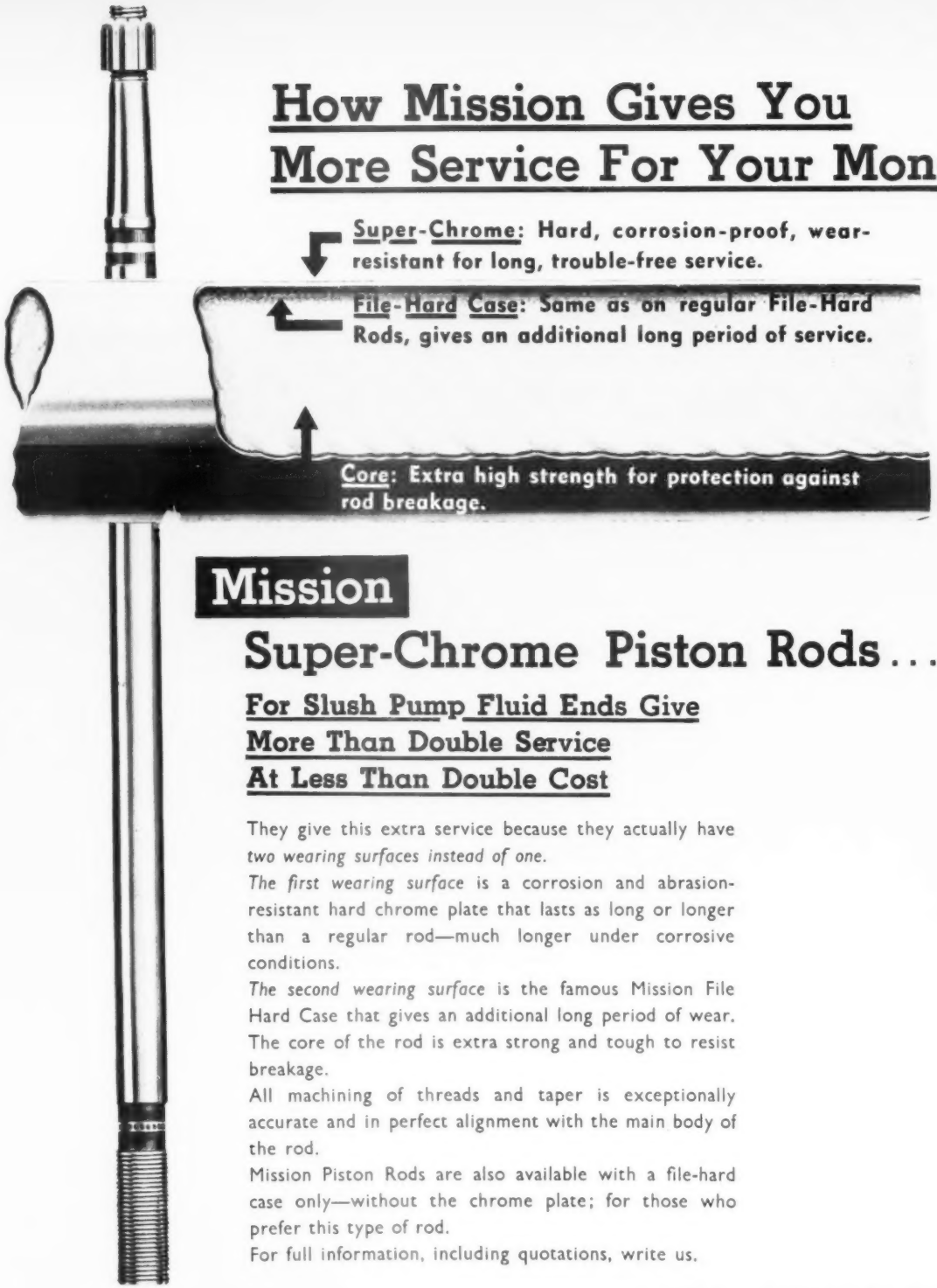
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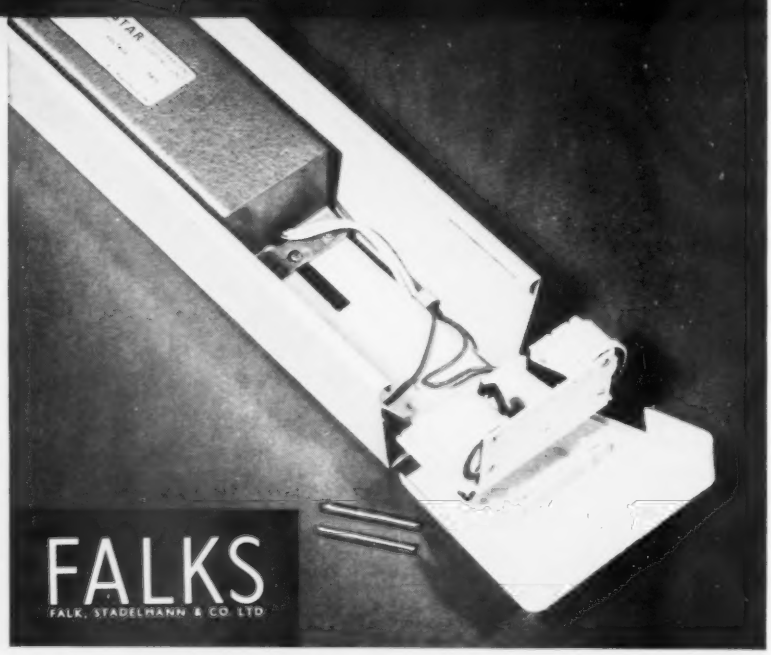

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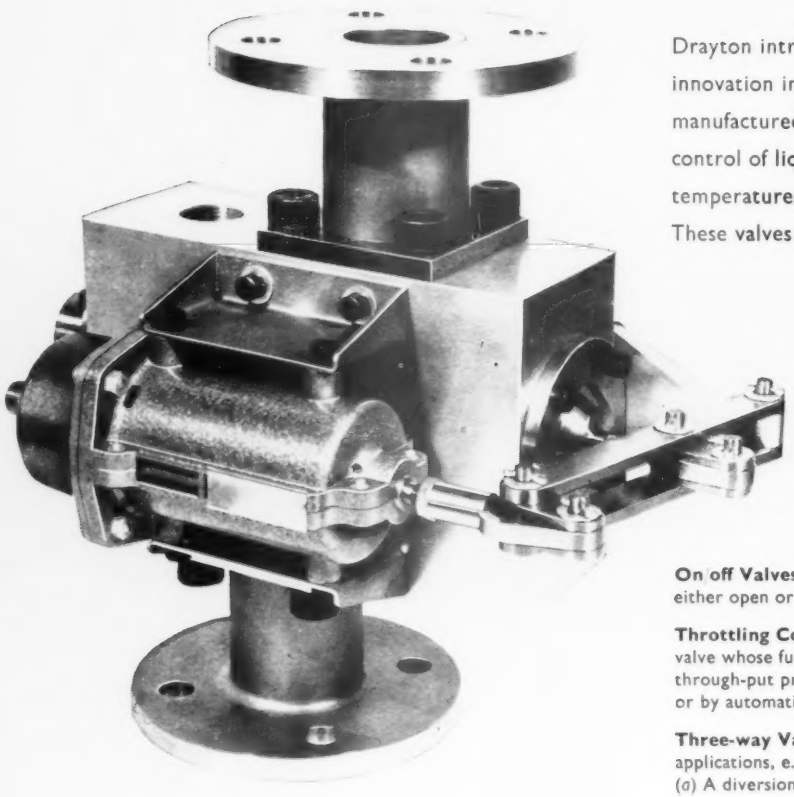

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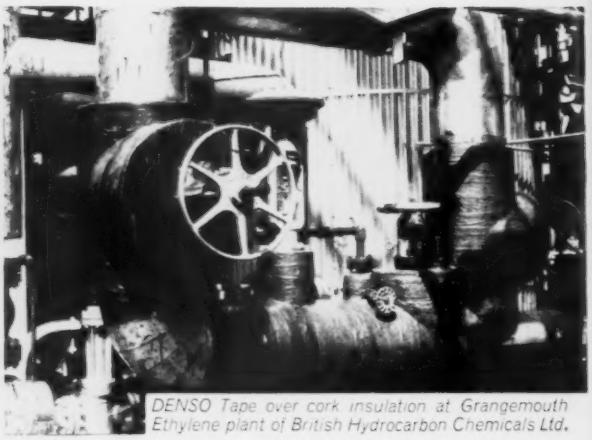

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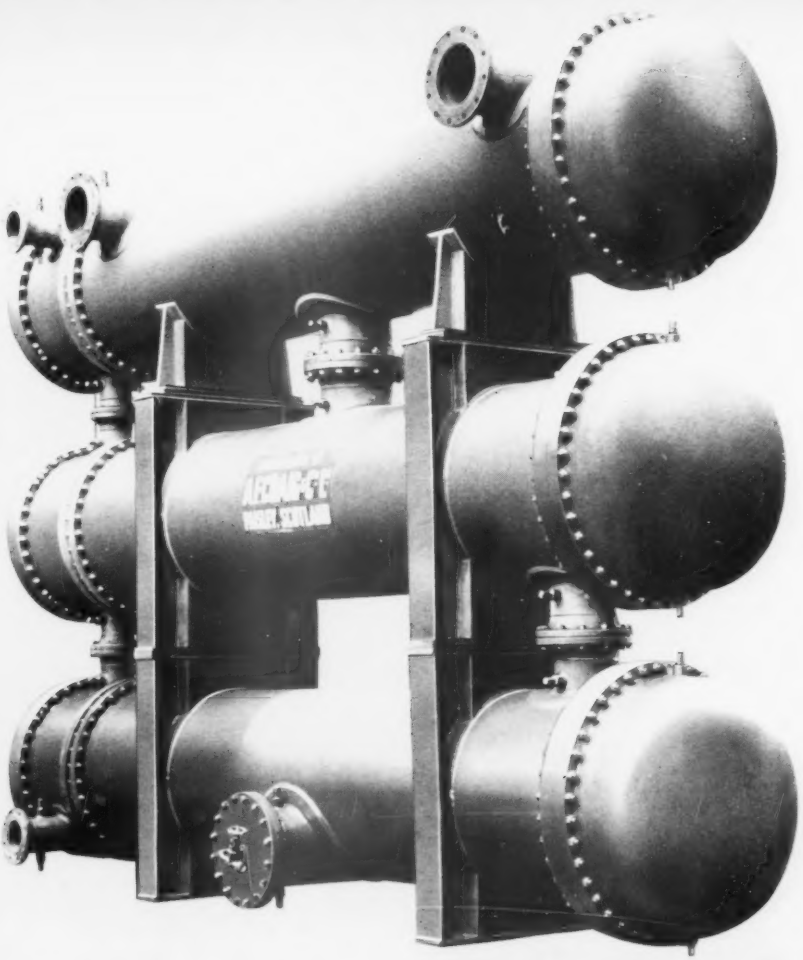

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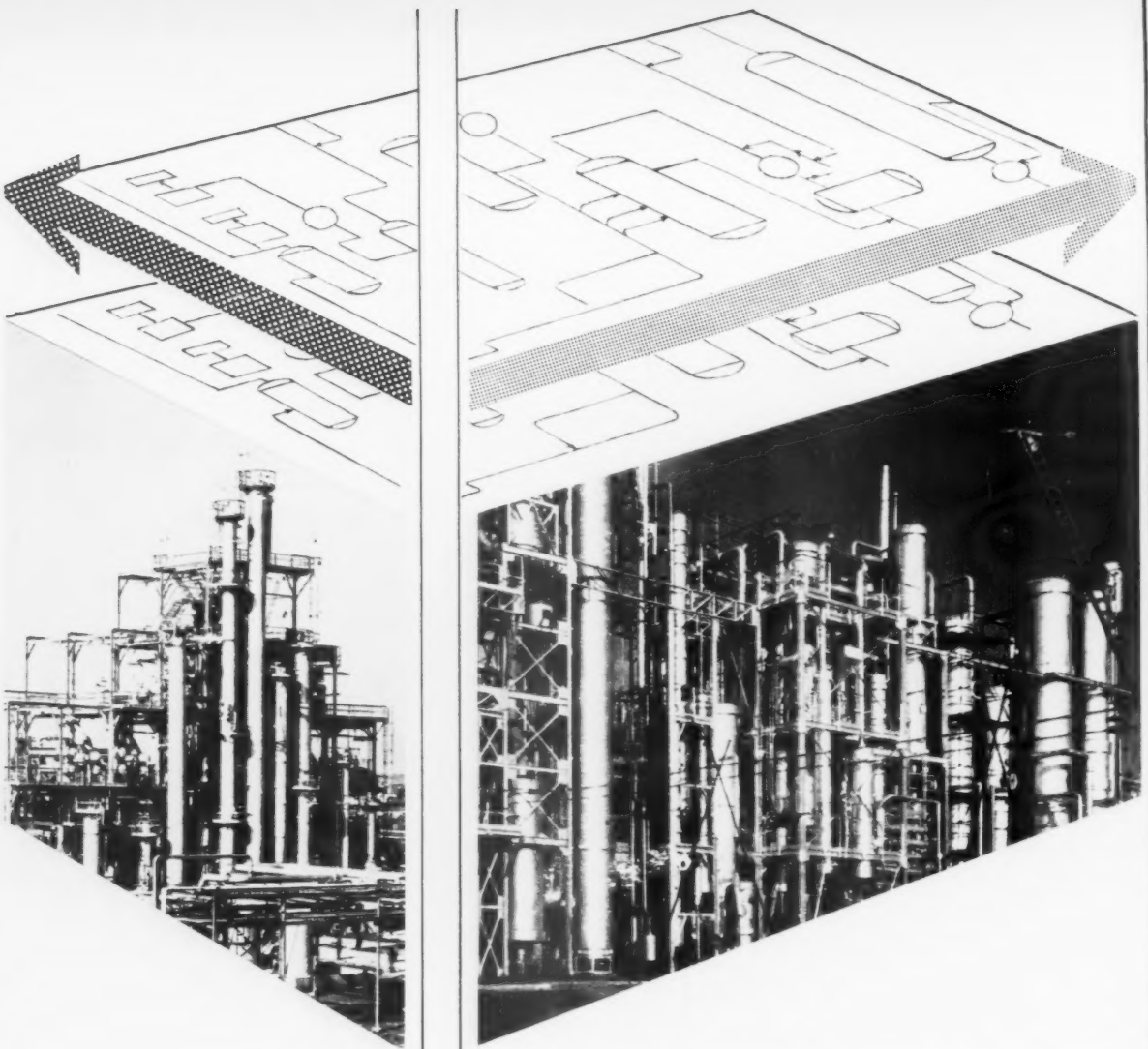

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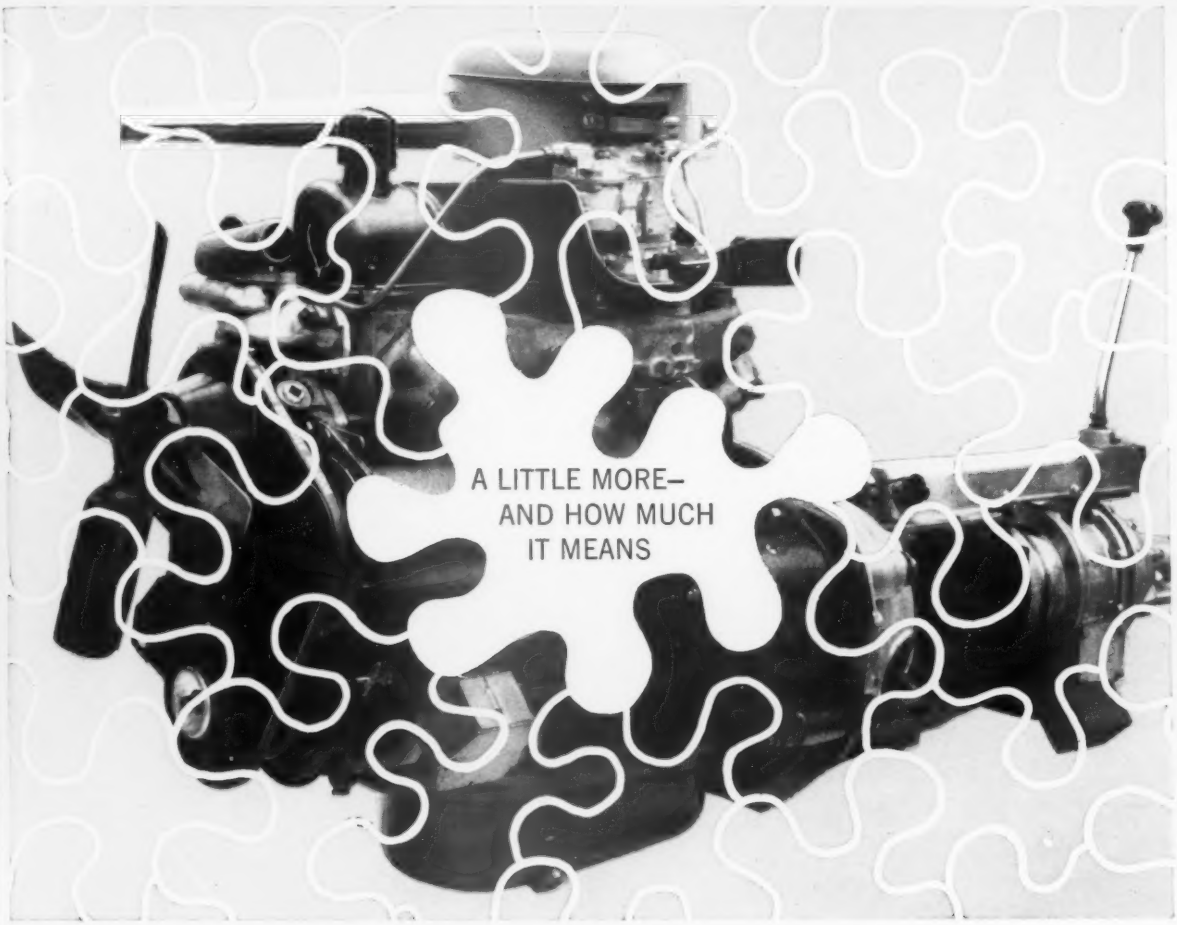

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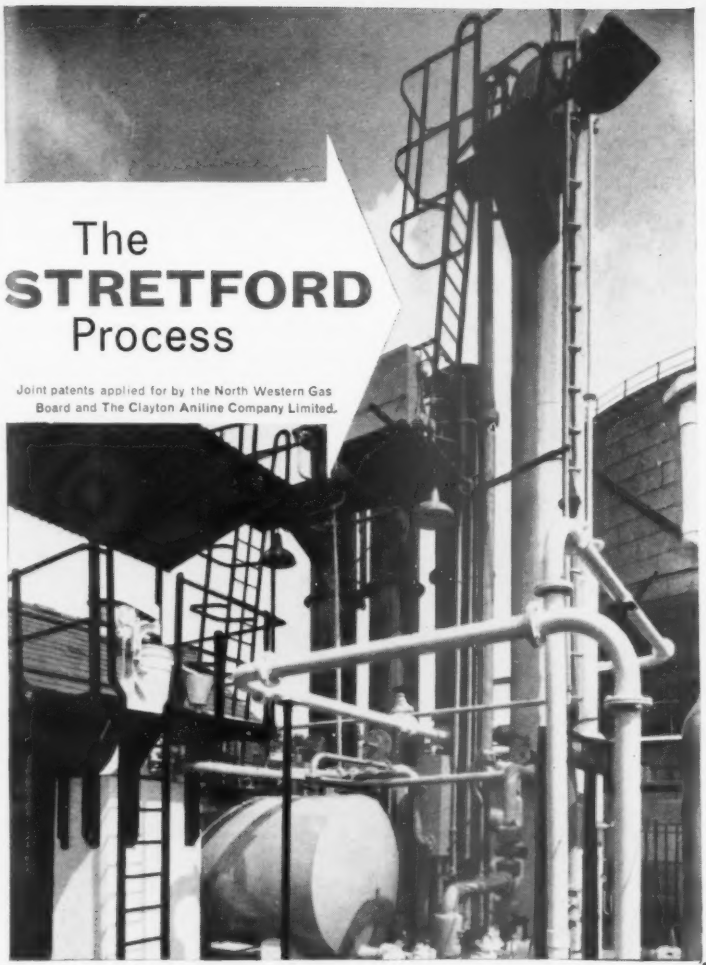
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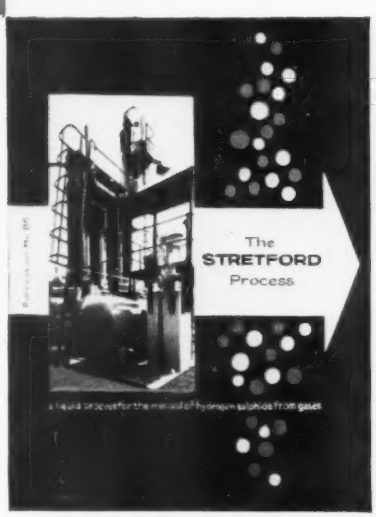

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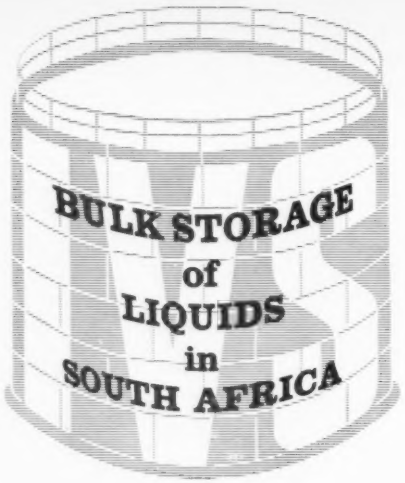

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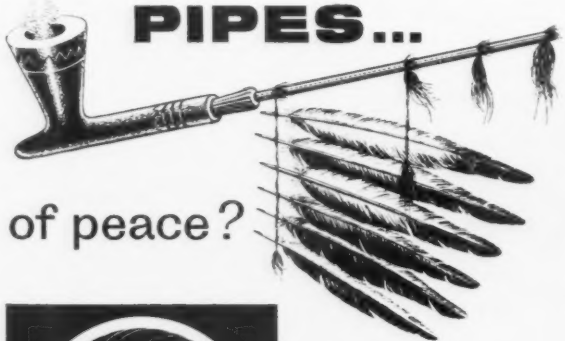

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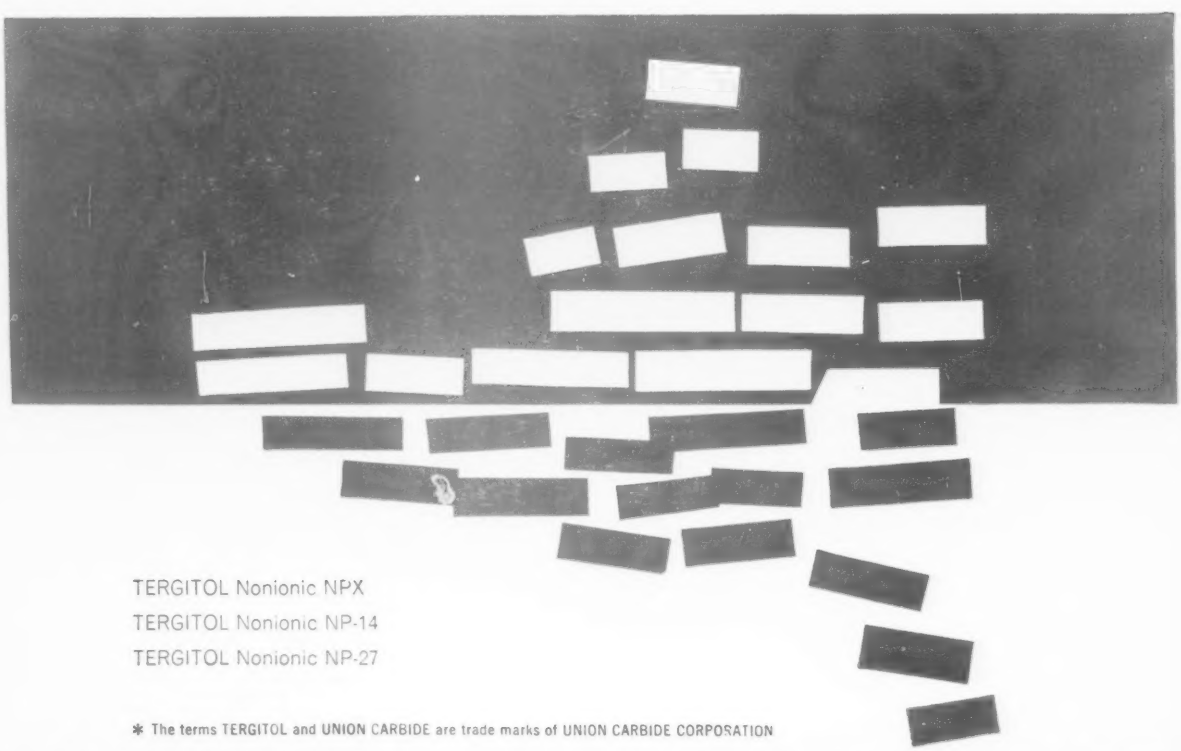

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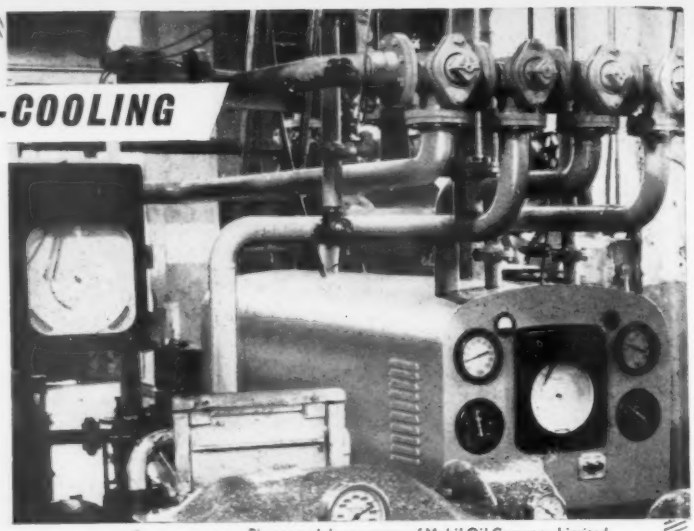

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Berry, Wiggins & Co. Ltd *(R. S. Caplin Ltd)*	xi
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Blaw-Knox Chemical Engineering Co. Ltd *(Auld & Tilbury Ltd)*	xii & xiii
Borax Consolidated Ltd *(The T.G.A. Co. Ltd)*	Feb.
John Brent & Co. (Shipbrokers) Ltd	Nov.
British Petroleum Co. Ltd, The *(S. H. Benson Ltd)*	ii & iii
Cameron Iron Works Inc *(Boone & Cummings)*	xvi
Constructors John Brown Ltd *(Stanley D. Dickson)*	xxiv
Consultants Bureau *(International Newspaper Advertising)*	Sept.
Edwin Cooper & Co. Ltd *(Dorland Advertising Ltd)*	May
Coppee Co. (Gt. Britain) Ltd *(Mayfair Advertising Ltd)*	Oct.
Costain & Press (Overseas Services) Ltd *(Dorland Advertising Ltd)*	Oct.
A. F. Craig & Co. Ltd	xxiii
Crane Packing Ltd *(Ruddocks Advertising Ltd)*	Nov.
Crosby Valve & Engineering Co. Ltd	Sept.
Dorr-Oliver Co. Ltd	Sept.
Drayton Controls Ltd *(Fordham Sadler Advertising Ltd)*	xxi
Drums Ltd *(Mayfair Advertising Ltd)*	Nov.
Esso Petroleum Co. Ltd *(McCann-Erickson Advertising Ltd)*	xxv
Falk Stadelmann & Co. Ltd *(Allardyce Palmer Ltd)*	xx
Fibreglass Ltd *(Notley Advertising Ltd)*	Nov.
Fisher Governor Co. Ltd *(Glovers Advertising Ltd)*	v
Fodens Ltd *(A. H. Knowles Ltd)*	Nov.
Matthew Hall & Co. Ltd	xvii
W. C. Holmes & Co. Ltd *(Cross-Courtney Ltd)*	xxvii
Honeywell Controls Ltd *(T. G. Scott & Sons Ltd)*	Nov.
Intermit Ltd *(Sandbrook, Metcalf & Co. Ltd)*	x
Island View Storage (Pty) Ltd *(Richard F. Robinow)*	xxviii
A. Johnson & Co. (London) Ltd. *(A. T. A. Advertising Ltd)*	xxx
S. H. Johnson & Co. Ltd *(Mayfair Advertising Ltd)*	Nov.
Kellogg International Corporation *(Reynell & Sons Ltd)*	xv
J. & T. Lawrie Ltd *(Ross Woodruff Ltd)*	May
Lindars Automation Ltd *(Rex Publicity Ltd)*	Nov.
B. Orchard Lisle (Industrial Cartography) *(International Oil & Gas Information Service)*	ix
London & Thames Haven Oil Wharves Ltd	iv
M. & C. Switchgear Ltd *(Rex Publicity Ltd)*	Oct.
Mannesmann-Export GmbH *(Hassenpflug & Lindstrom)*	Oct.
Metafiltration Co. Ltd *(George Cuming Ltd)*	Nov.
Metal Containers Ltd *(General Advertising Co. of London)*	Back Cover
Metal Propellers Ltd *(Hall O'Connor Ltd)*	xxvi
Mission Manufacturing Co. Ltd *(Walter Skinner Ltd)*	xix
L. A. Mitchell Ltd *(Wilson Advertising Ltd)*	vii
Mobil Oil Co. Ltd *(Masius & Fergusson Ltd)*	vi
Motherwell Bridge Contracting & Trading Co. Ltd	xviii
North British Rubber Co. Ltd *(Robert Freeman Co. Ltd)*	Sept.
Oil & Petroleum Year Book	xxviii
P. D. Engineering Co. Ltd *(Hyde & Partners Ltd)*	Nov.
Perkins Engines Ltd *(Crane Advertising Ltd)*	Sept.
Petrofina (Great Britain) Ltd *(Downtons Ltd)*	Oct.
Premaberg (Great Britain) Ltd	i
W. Press & Sons Ltd *(Stephens Advertising Service Ltd)*	viii
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Schlumberger Overseas S.A.	Oct.
Serk Radiators Ltd *(Longleys & Hoffman Ltd)*	Inside Front Cover
Shell International Petroleum Co. Ltd *(Mather & Crowther Ltd)*	xxxi
Shell-Mex & B.P. Ltd *(Colman, Prentis & Varley Ltd)*	xiv
SIE Division of Dresser A. G. *(J. Wild Advertising)*	Oct.
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Stone & Webster Engineering Ltd *(Thames Advertising Service Ltd)*	Inside Back Cover
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Tate Pipe Lining Processes Ltd *(G. Street & Co. Ltd)*	xxviii
Turner Brothers Asbestos Co. Ltd *(Crane-Wood Ltd)*	Aug.
Union Carbide Ltd *(C. R. Casson Ltd)*	xxix
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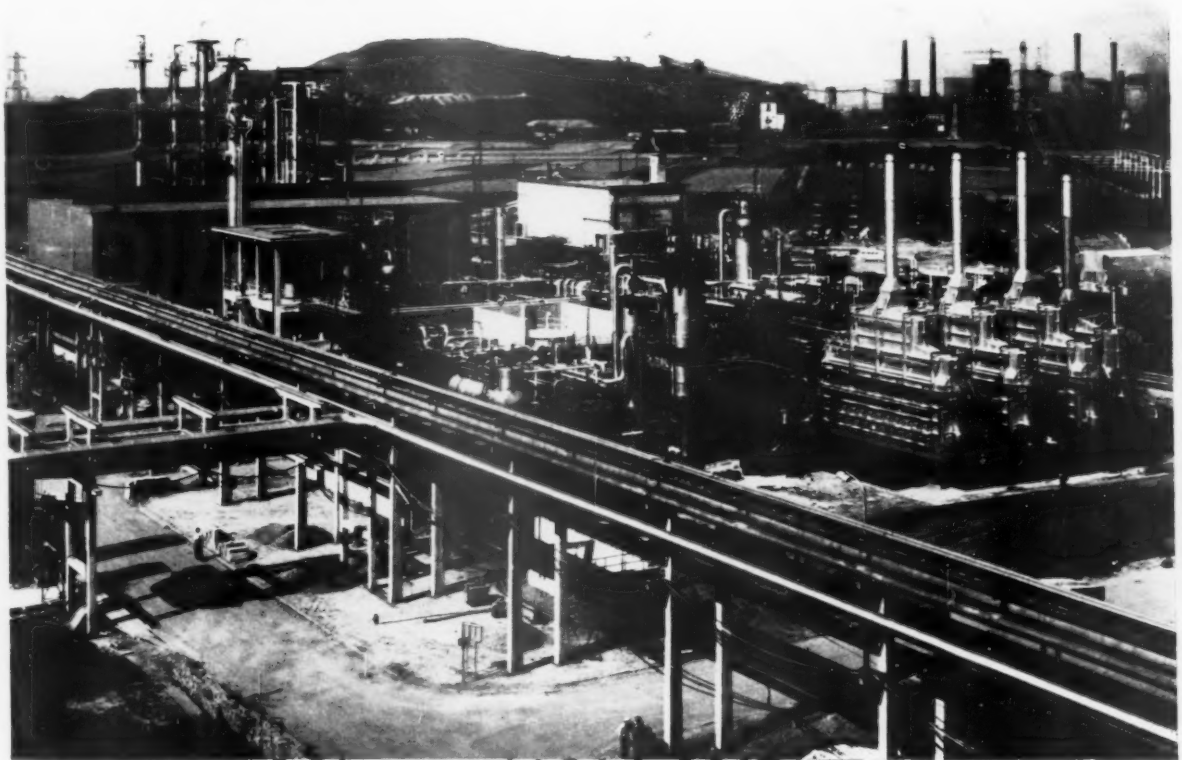

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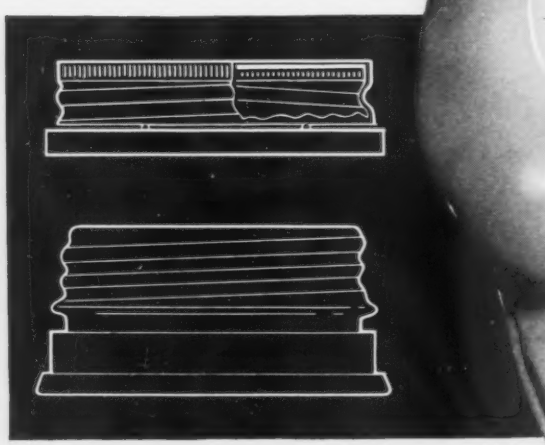

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